PROGRESS IN FARM-TO-PLANT *Bulk Milk* HANDLING

By Noel Stocker

FARMER COOPERATIVE SERVICE

U. S. DEPARTMENT OF AGRICULTURE

FCS Circular 8

November 1954

The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, financing, merchandising, quality, costs, efficiency, and membership.

The Service publishes the results of the studies; confers and advises with officials of farmers' cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

Joseph G. Knapp
Administrator
Farmer Cooperative Service

This study was conducted with marketing research funds made available through the Agricultural Marketing Service.

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 25 cents

CONTENTS

SUMMARY

BULK MILK handling offers considerable promise for both economies and increased returns to the producer, the hauler, and the plant through reduced costs, lower product losses in handling, improved milk quality, and expanded markets. Consumers stand to benefit from higher quality milk and may also share eventually in the savings resulting from efficient, integrated bulk milk handling operations.

Use of the bulk milk handling system from farm-to-plant is gradually expanding into many marketing areas of the country. It first appeared among extremely large dairy farms in California about 15 years ago. It next developed on farms of similar size in Florida. Over 5 years of experience with the facilities and techniques in bulk handling now have been accumulated at scattered operations outside California and Florida.

This report gives the results of a survey undertaken in the summer of 1953. It measures and describes the extent, location, and variable patterns of industry progress and trends in adopting the bulk handling system in all States other than California and Florida. These States were excluded from the survey because the milking herds are much larger than on typical farms in most parts of the country.

Of the total number of 129 plants reporting from the areas covered, 104 furnished usable questionnaires. Twenty-six of these plants were farmer cooperatives, the balance comprising various forms of other dairy firms. In the 46 States included, there were approximately 3,150 farm bulk cooling tanks.

With this system, a refrigerated bulk milk cooling and storage tank replaces the traditional 10-gallon can container on the farm. A specially equipped steel tank truck takes the place of the conventional van-type can-hauling truck. Milk transfers from farm tank to tank truck to plant storage through a reversible sanitary pump and hose mounted on the truck. On his pickup route, the operator of the tank truck inspects milk for appearance, odor, and temperature, measures volume, and samples for butterfat test and bacteria count. When conversion is complete among producers supplying a single milk plant, the tank truck becomes a "mobile country receiving station," making the typical plant can-receiving and intake facilities obsolete.

Bulk tank equipment requires substantial individual investments. In the transition to bulk milk hauling, plant management needs to plan carefully for substantial adjustments on the part of producer, plant, and hauler so they will all obtain the greatest benefits from the system. Some of the problems involved may include the field of patron relations, producer and hauler education, equipment selection, financing, installation and servicing, route reorganization, production and transportation "subsidy" payments by plants and increased competitive pressures in both procurement and sales.

Plants have devised a number of special changes in their conventional policies and practices in adopting the bulk milk program. Those assuming an aggressive role in promoting the system have been purchasing and reselling the farm tanks,

assisting with producer installations, financing, and disposing of obsolete equipment. Other plant policies in the changeover period include payment of premiums for farm tank milk that are not specifically related to quality, changes in milk pickup schedules, and charging lower hauling rates on bulk pickup deliveries compared to can pickup.

Essentially these practices are designed to protect and encourage expansion of the program by assuring a reasonably satisfactory rate of response from haulers and producers, or to meet competitive pressures of other firms, requirements of public health agencies, and the demands of producers.

Plant premiums and hauling savings through bulk milk shipping brought average direct monetary benefits to producers at 72 reporting plants of slightly over 12 cents per hundredweight of milk. This does not include any estimate of savings that some producers themselves might realize from lower unit capital and labor costs, or from reduced milk weight and butterfat losses through bulk handling methods. Such potential benefits should be of particular interest to cooperative plants for their members.

Payment by plants to producers of a price premium or "bonus" for farm tank milk not specifically related to quality was found to be a common practice. About 45 percent of all plants reported such price premiums in effect. These varied from less than 5 cents to a high of 25 cents per hundredweight of milk. The most frequent amount paid was 10 cents.

Additional, or in some cases, an alternative monetary incentive, was offered producers by dual-receiving plants in the form of reduced hauling charges under tanker assembly. About 75 percent of reporting plants indicated that average farm-to-plant hauling rates were lower than average can hauling rates. These average differentials varied from 2 cents to 20 cents per hundredweight of milk, the most frequent figure being 5 cents. In the case of one-third of the plants, price premiums were combined with direct tank hauling rate reductions for added tangible incentives to producers.

No attempt was made to determine what portion of these cash incentives was economically justified and what portion may have represented direct plant "subsidy."

Procurement policy trends indicated continued ownership and operation of hauling facilities by plants under the tank system, as well as a tendency of plants to shift from "for-hire" hauling arrangements under can pickup to ownership of tank collection facilities.

Distinct regional preferences existed for certain structural types and volume capacity of the transports. The most popular unit was the 1,500 gallon tank mounted on a straight-frame truck. This assembly accounted for nearly 30 percent of all farm-to-plant units. The 2,500 to 3,000 gallon trailer tanks powered by heavy-duty tractors were in rather common use only in the Pacific Northwest and certain areas of the Atlantic Coastal States.

About one-half of reporting plants received bulk milk on a daily pickup schedule from individual producers. In many areas, additional flexibility in milk collection and receiving procedure had been introduced immediately upon instituting the tank system of assembly. Every-other-day farm pickup schedules were in effect at some plants in every region, but the practice was nearly universally applied in Washington and Oregon. Health departments in other areas, however, had not given unanimous approval to tank milk collection on schedules other than daily. Multiple delivery to plants of two or more loads daily per truck from farm tank routes was becoming a fairly common practice in most regions.

Only 8 plants (all fluid milk

distributors) out of over 100 surveyed had converted 100 percent to the bulk handling system. Practically none of the dual-receiving operations had as yet reached the half-way point of converting producers or volume to the bulk handling program. About 80 percent of all plants surveyed, having 84 percent of all farm tanks, were primarily fluid milk distributors. However, the new methods are also being adopted in certain areas by some strictly manufacturing milk operations.

Mechanization of both production and farm transport in bulk handling lends considerable economic advantage to the larger volume units. The observed trends in the adoption of bulk milk handling by the larger commercial sized dairy farms and assembly trucks with larger capacities appear to substantiate this.

Comparative daily "graded" milk volume per farm in May 1953 averaged 1,015 pounds for all bulk shippers and 525 for can shippers. The consistent pattern of substantially larger deliveries by the bulk shippers is evident in each regional average comparison.

Similarly the average size of herd for the graded milk producers was 40 cows for bulk shippers and 22 cows for can shippers.

The 300 gallon bulk tank was found to be the most common sized unit in use on farms in the States surveyed. The 3 sizes of 200, 300, and 400 gallons together were reported as the most frequent installations by 90 percent of all reporting firms. Both the "cold-wall, direct-expansion" tank and the "ice-bank, sweet water refrigerated" tank cooler have come into popular usage but to varying degrees in different production areas.

Slightly over 10 percent of all bulk milk shippers were equipped with milking parlors and pipeline milking systems. The great majority of farms, however, have adapted their bulk tanks to conventional stanchion-type barns and machine-bucket milkers.

Inventory estimates of bulk handling installations in the United States show that at mid-1953 approximately 275 milk receiving and/or processing plants were obtaining deliveries direct from over 600 farm tank trucks serving about 6,200 farms equipped with bulk milk cooling tanks. This represents slightly over 1 percent of the commercial dairy farms in the United States.

About 55 percent of the plants, 65 percent of the tanker transports, and 50 percent of the farm tanks engaged in these operations were located in California and Florida. The plants served by the remaining installations were rather widely scattered over 28 other States and the District of Columbia.

Regionally, the most rapid expansion has occurred in the Pacific Northwest, several areas in the East North Central States, and within a number of Atlantic coastal areas.

Recent trends in adoption and expansion also indicate continuation of a steady but gradual shift to the new methods. Speed of the transition to bulk milk handling will be governed to a considerable extent by effects of educational and promotional efforts; attitudes and policies of numerous market institutions; industry competitive pressures; trends in farm prices and income; continued engineering, sanitary and economic research; adequate reasonable financing, and trends in prices and financing methods for the equipment needed.

Progress in Farm-to-Plant Bulk Milk Handling

by Noel Stocker
Dairy Branch, Marketing Division

BULK MILK handling—a new system of technology—is now gradually emerging to replace conventional methods of handling milk in the producing, transporting, and processing segments of the American dairy industry. This innovation promises eventually to evolve into one of the most important basic changes in the history of dairying.

Dairy cooperatives and their members have been taking an active part in applying this new technology—the changeover from can to tank handling. The study on which this report is based covered 26 farmers' cooperatives among the 104 dairy plants using the bulk milk system that were surveyed.

The bulk milk handling system first appeared among extremely large dairy installations in the Los Angeles, Calif., area about 15 years ago. It has gradually expanded to a great many market areas in both California and Florida. But it was not until 1948, when this type operation was adopted in Connecticut, that it moved outside these two States.

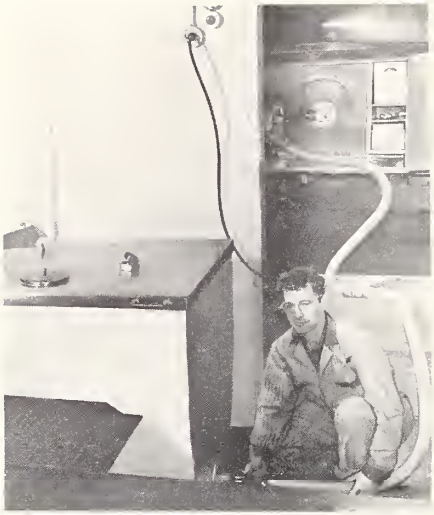
Over 5 years of actual bulk handling experience have now been accumulated by various firms outside California and Florida. Operators of numerous other dairy plants serving thousands of producers may eventually be confronted with numerous decisions concerning matters of policy, equipment and techniques under proposed bulk handling operations.

The dairy farmer, milk hauler, and dairy plant are all fundamentally involved in this three-way transition in facilities, techniques, and methods used to produce, collect, and receive the raw milk.

In the most commonly used type of bulk milk system, a refrigerated bulk milk cooling and storage tank or vat replaces the traditional 10-gallon can container and cooling device in the farm milkhouse. This tank is designed for rapid cooling and low-temperature storage of the milk between milking and collection time.

The conventional insulated, van-type, can-hauling truck gives way in the assembly process to a specially equipped, insulated, stainless steel tank truck. Operator of the tank truck inspects bulk milk for quality, measures volume, and samples for butterfat content and bacteria count at each calibrated farm tank on the scheduled pickup route. Milk transfers from farm cooling tank to tank truck to plant storage through a reversible sanitary pump and hose mounted in a specially equipped truck compartment. Frequently the plant needs additional pumping, pipelines, storage, and tank truck washing facilities to handle the milk.

Finally, where conversion is complete among producers supplying a single milk plant, the transport tanker becomes a "mobile country receiving station," thus making obsolete the typical plant can receiv-



A "receiving station on wheels"—a tank truck of the Dairymen's League Cooperative Association, Inc., headquartered in New York City, picking up milk from a farmer's bulk milk tank.

ing and intake facilities for milk.

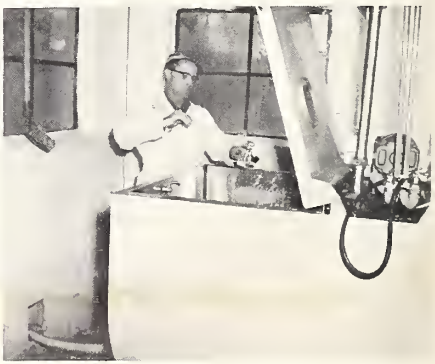
The bulk milk handling system offers considerable promise for both economies and increased returns in producing and handling milk. These results can come about through cost reductions, quality improvement, and expansion of markets. The system is an integrated approach from farm to market, combining a series of new production and marketing investments, facilities, and techniques.

Greatest overall benefits could be realized in a given area if all segments of the industry shifted completely to bulk handling at one time. However, as unequal responses and pressures develop among the many diffuse, dissimilar elements of the industry, numerous areas of stress appear to be developing.

The impact of mechanization of both production and farm transport in bulk handling lends considerable comparative economic advantage to larger volume operations. This factor among others frequently creates significant new problems requiring careful planning and substantial adjustments at the plant level. These may include the field of patron relations, producer and hauler education, quality controls, equipment selection, financing programs, installation and servicing, route reorganization, production and transportation "subsidy," and increased competitive pressures in both procurement and sales.

A completely integrated system of bulk milk handling from the farm through the plant necessarily imposes material shifts in the relative use of labor and capital by producers, haulers, and plants. For instance, the dairyman now cools the milk to from 15° to 25° lower than formerly, and at times may furnish adequate farm storage capacity for several days' volume; the inspection, "weighing", and sampling functions are reassigned and the "for-hire" hauler may carry added responsibilities and investment to accomplish this; and the plant now washes and sanitizes the hauler's truck tank and must often continue a dual system of milk receiving for an extended period of time.

Thus a more orderly and efficient, if not a more rapid transition could probably result from a reasonably equitable balancing of the incentives and benefits each group receives with the contribution each makes to the total conversion.



Truck driver taking butterfat sample from farmer's bulk milk tank.

Overall efficiency gains in recent decades in applying technological improvements to dairy farming have lagged somewhat compared to the advances scored by certain other agricultural enterprises. However, trends toward conversion to a number of new mechanized practices are gradually developing. Mechanization and improved methods not yet generally adopted now present one broad area of challenge to an industry searching for ways and means of surmounting its problems and capitalizing on its opportunities.

Survey Objectives and Procedures

AS INTEREST in bulk milk handling spread, a number of cooperative and other industry representatives contacted the Farmer Cooperative Service for information on the progress and nature of specific practice and problems now emerging under the bulk milk handling system.

The Service therefore made a review of recent industry experience in order to furnish these representatives with some basis for individually judging prospects and planning for this development.

Objectives

The principal objectives of the survey were:

1. To describe and appraise the nature and extent of pertinent industry practices, trends and problems developing in the adoption of the bulk milk handling system.

2. To furnish preliminary data and other information to help in subsequent research concerned with economic evaluation of specific operating phases and problem areas.

This initial nationwide survey was intended to provide a composite perspective of some industry trends and overall progress up to the present state of development. The inventory measures the impact of this technology upon specific segments of the industry and appraises some implications of present trends.

Available data and other information obtained on plant experience have disclosed a number of specific problem areas frequently encountered. Such current or potential problems may be further explored and evaluated in subsequent research.

No implication is intended that transitional problems supersede the probable overall benefits; neither are these problems considered constant or insurmountable when confronted by a given individual firm, hauler, or producer. For the present it is hoped that a review of industry observations will serve to suggest clearly the advisability of recognizing and preparing to meet possible areas of stress in the planning stage.

Careful planning at all levels before instituting an integrated bulk system can minimize or possibly avoid many difficulties, thus increasing the opportunity of realizing maximum benefits. An appreciation of the experiences of pioneer firms in the field may assist management. However, individual local conditions must be evaluated in considering the potential benefits and possible problems during the planning and transitional stages.

Coverage and Response

In making this survey we developed a list to include all dairy plants and milk dealers known or believed to be receiving regular milk shipments by tank assembly direct from farms of producer-patrons as of June 1953. We asked each State Department of Agriculture or Board of Health, farm

449130 O - 58 - 2

tank manufacturing firms, and various university dairy departments to forward this information.

The total number of plants or firms listed was 165 . . . 38 of them farmers' cooperatives and 127 other types of organizations. The complete list was considered too large for intensive survey by personal interview.

We made no attempt by sampling to survey and appraise the opinions of firms not engaged in bulk milk handling. A few selected firms were visited to obtain supplementary information from management, employee "bulk milk specialists," haulers, and producers.

Of the 165 firms contacted by mail, 140 or about 85 percent responded. Thirty-six of the reporting firms stated that they were not presently engaged in bulk milk handling operations. Many of these indicated, however, that they were seriously considering instituting the system, possibly within a year. These firms were not resurveyed before final preparation of this report.

Thus, 104 usable questionnaires represented about 80 percent of the final listing of applicable firms. Twenty-six of these were farmer cooperatives, with the balance comprising various forms of other dairy firms.

About 15 of the 25 nonreporting firms were receiving some milk by tank assembly at the midyear point. To that extent, the inventory summary indicated the degree of progress within the industry. Bulk milk operations of many active firms are also being steadily expanded among producers and haulers. Moreover, some additional firms have adopted the system since the survey was completed.

As pointed out earlier by far the most intensive applications of bulk handling techniques have been made in certain areas of California and Florida. Progress by many producers, haulers, and plants over a 15-year span has developed to the point where it has, or is becoming, the most common system. Because of the great number of farms and plants involved, and the fact that comparable production conditions are seldom found to exist in most other milk producing areas, these two States were omitted from the formal survey. However, a brief description of the techniques of operations in the two States are given in a later section on page 6.

Bulk milk shippers supplying milk to the reporting plants in some cases were located in one or more States other than the State where the plant was located that receives the milk. In a few instances also, the bulk milk originates on farms in a different region than the regional site of the buying milk plant. The geographic divisions as defined by the Bureau of the Census were used. However, all survey data classified geographically were related to the location of the milk plant or firm.

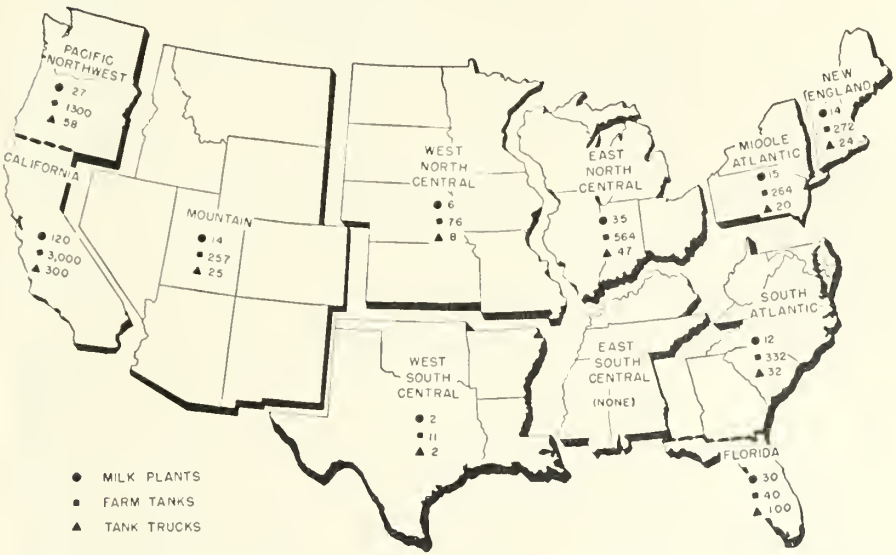
Location of Bulk Milk Handling Operations

Present Status

FIGURE 1 gives the number and location of reporting firms receiving milk direct by farm tank assembly in June 1953 by regions, along with corresponding numbers of farm bulk tanks and farm-to-plant tank trucks in operation.

Regional trends in adoption of the bulk milk system show that the most rapid expansion is taking place in the Pacific Northwest, several areas in the East North Central States, and within a number of Atlantic Coastal States. Nearly one-half of the "active firms" receiving bulk milk deliver-

Figure 1.—Estimated number of milk plants, farm bulk tanks on routes, and farm tank trucks operating in bulk milk handling in selected States by regions, June 1953.



ies from about two-thirds of all farm tanks were located in Washington, Oregon, and the 5 East North Central States. No farm tank pickup routes were reported in any of the 4 East South Central States or in 14 States scattered throughout several regions. This does not mean that no farm bulk tanks had been installed on dairy farms in those States. Some producers, probably few in number, have purchased bulk tanks and are transferring the milk from the tank by pump or gravity into cans while awaiting tanker pickup service or formal approval of the method by health authorities. Progress to date of survey in the West South Central Region was not significant from the standpoint of numbers.

Table 1 shows the regional distribution of the facilities operating in bulk milk handling programs as reported. The data are given separately for the reporting firms and as estimates for nonreporting groups included in the survey. The table includes only those firms receiving milk direct from farmer patrons by the tank assembly method. Information submitted by several plants then in the process of organizing a tank truck route was excluded.

At the midyear point at least as many as 75 farm tanks were installed on farms in areas where tank truck collection service was not yet available, and at dairy departments of a number of State agricultural experiment stations. Including these, the inventory of farm bulk cooling tanks in the 46 States surveyed would thus total approximately 3,150.

According to figures of the Bureau of Dairy Service, California State Department of Agriculture, nearly 3,000 farm bulk tanks had been installed in that State at midyear. This milk was being received by over 120 dairy plants, with at least 85 of these on a 100 percent tank pickup basis for supplies. No data were available on numbers of operating farm tank trucks. But considering the size of many of the

Table 1.—Estimated numbers of dairy firms, farm bulk tanks on routes, and farm tank trucks operating in selected States by regions, June 1953 [1]

Region	Number of dairy firms			Number of farm bulk tanks on routes			Number of farm tank trucks operating		
	Reporting	Non-reporting [2]	Total	Reporting	Non-reporting [2]	Total	Reporting	Non-reporting [2]	Total
New England	12	2	14	227	45	272	21	3	24
Middle Atlantic	14	1	15	237	27	264	18	2	20
South Atlantic [3]	9	3	12	292	40	332	29	3	32
East North Central	32	1	33	556	8	564	46	1	47
West North Central	6	----	6	76	----	76	8	----	8
Mountain	10	4	14	177	80	257	18	7	25
Pacific (Washington and Oregon)	18	9	27	1,160	140	1,300	47	11	58
West South Central	1	1	2	1	10	11	1	1	2
East South Central	----	----	----	----	----	----	----	----	----
Total	102	.21	123	2,726	350	3,076	188	28	216

[1] Estimates for California and Florida excluded.
[2] Estimates obtained from various figures appearing in industry trade journals and from state health or agriculture officials.
[3] Includes figures for plants located in District of Columbia.

dairy farm enterprises and usual tanker capacities there may have been upwards of 300.

A partial survey of bulk milk handling operations conducted by the Florida State Board of Health disclosed that over 30 distributing firms were receiving milk by bulk handling equipment. However, only two of these plants were receiving bulk milk handled and delivered by techniques strictly comparable to the methods in general use among the other 46 States surveyed.

Possibly 90 percent of the market milk produced in Florida was being delivered to plants by tanker transport. The great bulk of this volume, however, was handled by producers who own their own tank trucks. In many instances the milk was drawn from the cows through permanent, cleaned-in-place pipelines, cooled in a plate cooler and pumped directly into the tank truck for holding. Two milkings covering a 24-hour period were normally placed in these tank trucks and then delivered to the plants. For example, in the Miami milkshed alone, it was estimated that there were 72 tank trucks and only 84 dairymen.[1]

For purposes of total national inventory including California and Florida, there were about 6,200 farm bulk tanks installed on farms in June 1953.[2] It is also estimated that milk from these tanks was being delivered to about 275 plants in 30 States by over 700 farm-to-plant tanker transports.

A breakdown of these estimated overall inventories is given in Table 2 for each State on a plant location basis.

---

[1] It is understood that somewhat similar conditions also prevail in a number of areas in several California markets, notably Los Angeles. It was reported that the latter market is now converted 100 percent to tanker delivery of milk.

[2] This overall figure compares favorably with an industry estimate based on an August 1953 survey conducted by the *American Milk Review* of 6,550 farm tanks. (Myrick, Norman. WHERE DO WE STAND AFTER FIVE YEARS OF BULK HANDLING. American Milk Review, Volume XV, No. 9, September 1953, p. 10.)

Table 2.—Estimated total inventory of dairy firms, farm bulk tanks, and farm tank trucks engaged in bulk handling operations by geographic divisions and by State,[1] June 1953

State and Region	Number of firms receiving milk direct from farm tankers			Number of farm bulk milk shippers			Number of operating farm tanker transports		
	Surveyed	Estimated	Combined	Surveyed	Estimated	Combined	Surveyed	Estimated	Combined
Maine	1	----	1	39	----	39	2	----	2
Massachusetts	5	----	5	79	----	79	8	----	8
Connecticut	5	2	7	108	45	153	10	3	13
Rhode Island	1	----	1	1	----	1	1	----	1
New England	12	2	14	227	45	272	21	3	24
New York	7	1	8	107	27	134	10	2	12
Pennsylavnia	5	----	5	79	----	79	6	----	6
New Jersey	2	----	2	51	----	51	2	----	2
Middle Atlantic	14	1	15	237	27	264	18	2	20
Delaware	----	1	1	----	14	14	----	1	1
Maryland	1	1	2	8	27	35	1	2	3
District of Columbia	6	----	6	268	----	268	25	----	25
North Carolina	1	----	1	8	----	8	1	----	
South Carolina	1	1	2	8	9	17	2	1	
Florida	----	30	30	----	40	40	----	100	100
South Atlantic	9	33	42	292	90	382	29	104	133
Wisconsin	16	1	17	340	8	348	23	1	24
Illinois	10	----	10	130	----	130	15	----	15
Michigan	1	1	2	28	10	38	1	1	2
Ohio	2	1	3	42	12	54	2	2	4
Indiana	3	----	3	16	----	16	3	----	3
East North Central	32	3	35	556	30	586	44	4	48
Minnesota	3	----	3	36	----	36	4	----	4
Iowa	2	----	2	38	----	38	3	----	3
Nebraska	1	----	1	2	----	2	1	----	1
West North Central	6	----	6	76	----	76	8	----	8
Arizona	5	2	7	98	60	158	12	5	17
Nevada	3	----	3	37	----	37	4	----	4
Utah	2	1	3	42	10	52	2	1	3
Idaho	----	1	1	----	10	10	----	1	1
Mountain	10	4	14	177	80	257	18	7	25
Washington	13	6	19	854	100	954	34	8	42
Oregon	5	3	8	306	40	346	13	5	18
California	----	120	120	----	3,000	3,000	----	300	300
Pacific	18	129	147	1,160	3,140	4,300	47	313	360
Texas	----	1	1	----	12	12	----	1	1
Louisiana	1	----	1	1	----	1	1	----	1
West South Central	1	1	2	1	12	13	1	1	2
United States	102	173	275	2,726	3,424	6,150	186	434	620

[1] No plants were reported in the states of Missouri, Montana, Colorado, Georgia, West Virginia, New Mexico, Virginia, Oklahoma, Arkansas, Tennessee, Mississippi, Alabama, Wyoming, New Hampshire, and Vermont. A few farm tanks had been installed in the first 8 of the States listed above. The first tanker routes to serve these and other farm tanks may be organized in the future.

How Development Has Expanded

Information was obtained from 105 firms relative to individual plant history and operating experience with the farm tank assembly system.

The system first emerged from its 8- or 10-year confinement in California and Florida when it was adopted on an experimental basis by a single firm in Connecticut in April 1948. All but one of the other reporting firms in Connecticut did not initiate the new method until the spring of 1952.

Other information showed, however, that in December 1949, a firm in South Carolina established a bulk handling program. This farm tank route was followed several months later by installations in 1950 in Arizona and Utah. One firm each in Iowa and New Jersey commenced tank truck pickup in April 1951. In December 1951 three firms in Wisconsin, Illinois, and Ohio started their first routes. Two operating cooperatives in the Pacific Northwest next organized tank truck pickup routes early in 1952.

In the case of 18 plants, 3 or more months elapsed between the month of organizing the tanker route and month of installing the first farm bulk tank. Nearly two-thirds of the firms reported that no apparent "lag" was experienced.

Forty reporting plants had each received bulk milk from farms for periods of less than 6 months. The receiving period for 70 reporting plants was 1 year or less. In total, the industry had accumulated about 1,100 "plant months" of experience in receiving milk from farm tank trucks.

Trends in Commercial Dairy Farming

Examination of census data permits some interesting comparisons of certain relevant trends. It also provides a partial measure of contrast in the extent of mechanized progress on dairy farms and some historical adjustments to them, and suggests possibilities for expansion in bulk handling.

For example, size of the dairy farm enterprise as well as market outlets affect costs and returns under bulk and conventional milk handling methods.

The size and relative importance of these farms vary widely among regions and among sections or markets within states. Moreover the numbers of farms producing milk and the average size of dairy enterprises have changed considerably over the past 25 years.

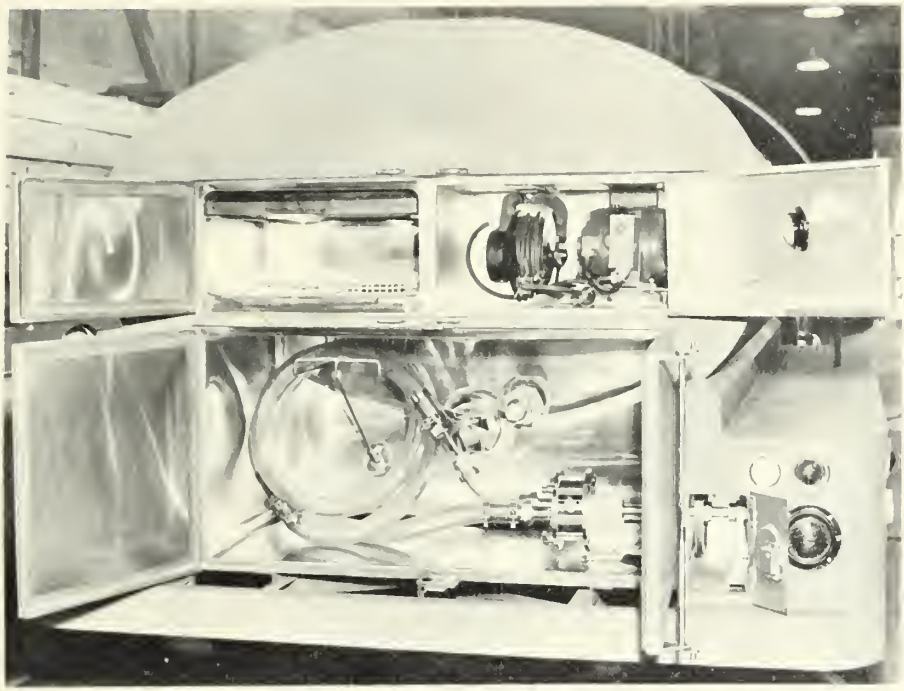
Appendix Table 1 indicates the trend toward decreasing numbers of commercial-sized herds and larger producing units. Commercial farms are those reporting the annual sale of milk or other dairy products valued at $1,200 or more. Herds with 10 or more milk cows have increased from 12 percent of the total in 1929 to nearly 18 percent in 1950.

The 1950 census indicates that 3,648,000 or 67.8 percent of the 5,382,000 farms enumerated reported producing some milk. However, over 46 percent of all farms reporting milk cows did not sell milk or cream to dealers or handlers.[3]

There is perhaps no true average farm or average dairy farm enterprise with respect to scale or type of operation. Studying typical units, however, either for regions as a whole or for smaller agricultural areas, provides a useful concept in understanding the basic structures of commercial or specialized farm enterprises.

Additional background information with respect to total numbers of commercial dairy farms and

[3] U. S. Bur. of Agr. Econ. FARM PRODUCTION, DISPOSITION, AND INCOME FROM MILK, 1940–49. Revised Estimates 24 pp. See p. 1, Washington, Apr. 1952.



Rear stainless-steel "pump-out compartment" of a farm tank truck showing centrifugal pump, coiled plastic hose, electric motor and cord, and sample bottle trays.

average size of milking herd by States and regions is given in Appendix Table 2. National totals show about 602,000 commercial dairy farms with an average milking herd of 15.8 cows. Regional averages in size of milking herds varied from a high of 27.9 cows in the 3 Pacific States to a low of 11.7 cows in the West North Central States. From these data, additional comparisons may be made with certain inventory averages disclosed from the industry survey reported later.

The expansion in the use of milking machines has been generally regarded as the most important single development affecting the handling of milk on farms over the past 30 years. They were first introduced in the United States around 1890, and as of January 1, 1952, almost 700,000 farms had milking machines. The seven States of Wisconsin, Minnesota, Michigan, Iowa, New York, Ohio, and Pennsylvania had about 57 percent of the farms with milking machines in 1952.[4]

Farm management studies have generally regarded the investment in milking machines as warranted for herds of 10–12 cows or more. Recent trends covering a 10-year period in the adoption of milkers are shown on a regional basis in Appendix Table 3, contrasted to current estimates of farm bulk milk cooling tanks. These trends toward universal usage are regarded as closely related to the expansion in rural electrification in the case of milking machines, as well as the decrease in number of workers on farms and other factors.

Expanded use of mechanical refrigeration for cooling milk on farms is steadily replacing natural cooling by water, ice, and air in a number of areas in recent years. Plate coolers, surface coolers, the immer-

[4] U. S. Bur. of Agr. Econ. FARM POWER AND FARM MACHINES, F. M. 101, 35 pp. See p. 28, Washington, February 1953.

Mechanical spray can cooler with side opener is a type used on many commercial dairy farms still using can pickup.

sion and spray-type can-cooling cabinets and wet boxes are now used by a large proportion of commercial dairy farms in many fluid milk supply areas.

The 1949 census of manufacturers is the only year for which data are available on shipments of mechanically refrigerated farm dairy or milk coolers. During this year, total shipments amounted to 37,563 coolers valued at $7,785,000. Of this number, there were 16,707 units of 5-can size or smaller valued at $2,905,000 and 20,856 units of 6-can size or larger valued at $4,880,000.[5] It appears reasonable to assume that annual production of these coolers during the succeeding 5 years would be at least equal to the 1949 figures. Increasing stringency of sanitary and cooling requirements in milk production, high levels of capital investment in other farm machines, and replacement of existing coolers are factors tending to sustain or increase the rate of adoption of such equipment.

Milking parlors are an innovation appearing on some dairy farms in recent years, associated particularly with the advent of the "loose housing system" for herds. Following are summary data from the Bureau of the Census, Department of Commerce, giving some indication of the extent of adoption of this system in more recent years.[6]

Item	*1951*	*1952*
Number of manufacturers	13	16
Number of milking parlor stalls produced	6,902	7,547
Number shipped	6,182	8,625
Factory value of shipments	$601,000	$741,000

[5] U. S. Dept. of Com. 1949 CENSUS OF MANUFACTURERS, Washington, D. C.

[6] Bureau of the Census, Industry Division, U. S. Dept. of Com., FARM MACHINES AND EQUIPMENT 1952. 25 pp. Pp. 15 and 22. Washington, Aug. 1953.

Practically all of the above equipment was for domestic use. Perhaps an average of 4 to 6 stalls are installed by dairymen converting to this system.

Some farm management studies have claimed that substantial labor economies may be realized at certain scales of output and size of herd using a modern, completely integrated milking system consisting of "loose housing," milking parlor, closed pipeline and bulk milk cooling tank. The bulk refrigerated milk cooling tank is thus often considered a natural complement to the modern integrated parlor-pipeline system.

Bulk Handling Operations

ONE broad measure of the rate of progress in adoption of the system is the extent of complete conversions among plants active in the program. Of 102 firms reporting, 8 reported the shift to farm tanker assembly had been completed at the midyear point. The degree of the shift reached among the other 94 firms, all of which reported dual receiving operations, varied considerably. Comparative can and tank patronage and volume data show, however, practically none of these plants had as yet reached the half-way point in conversion.

Kinds of Dairy Plants

The reporting firms were classified by major types of organizational structure on a regional basis in Appendix Table 4 by individual proprietorships, partnerships, proprietary corporations, and cooperatives.

About one-fourth of reporting firms were farmers' dairy marketing cooperatives, while three-fourths were other types of dairy firms. At midyear, the latter group of reporting firms had about 62 percent of all farm tanks installed among patrons while the cooperatives accounted for about 38 percent of the total.

Appendix Table 5 shows this classification of reporting firms and farm tank inventory in two major groups, cooperative and other types of dairy firms and into sub-groups according to principal operating function. About 87 percent of the latter group functioned primarily as strictly fluid milk distributing and processing plants. Among them, they accounted for about 76 percent of all farm tanks under this category.

In the cooperative group, 54 percent of all plants having 62 percent of the farm tanks were either: (1) distributing and processing, or (2) combined bargaining, distributing,

Pumping Grade A milk from 1,500 gallon farm tank truck into plant storage tank at Watertown, Wis., receiving station at Dairyland Cooperative Assaciatian, Juneau.

449130 O - 58 - 3

Table 3.—Location, type of operation, volume, and other factors relative to firms totally converted to bulk milk operations, June 1953[1]

Location	Principal type of milk handling operation	Number of bulk tanks installed	Average daily milk receipts May 1953 (in pounds)	Average daily deliveries per farm (in pounds)	Estimated number of mos. to accomplish conversion	Average size tank (gallons)	Average size herd (cows)	Frequency of milk pickup
Connecticut	Fluid milk distribution	6	N. A.[2]	N. A.	6	400	N. A.	([3]).
New Jersey	do	17	15,028	884	12+	150	50	([3]).
New Jersey	do	34	53,828	1,583	12+	200	24	([4]).
Pennsylvania	do	30	N. A.	N. A.	12	150	24	5 times weekly.
Wisconsin	Distributing and processing	20	N. A.	N. A.	8	150	25	([5]).
Michigan	do	28	15,663	560	6	200	26	([4]).
Nevada	do	24	20,387	850	6	300	N. A.	([4]).
Washington	do	18	20,000	1,110	3	400	N. A.	([4]).
All firms	8 firms	177	------	[6] 997	8+	250	(5)30	Variable.

[1] California, as noted previously, had over 85 plants receiving all milk via farm tanker assembly, while Florida reported over 30 such firms.
[2] Not available.
[3] Everyday collection of milk from farms.
[4] Every-other-day or "skip-day" collection of milk from farms.
[5] Pattern of collection from farms was not consistent. Some farms or routes were served everyday by tank truck and some on alternate days.
[6] Two firms reporting average daily deliveries per farm did not report the average size of herd.

and processing associations. All cooperative plants were located in the two North Central, Middle Atlantic, and Pacific regions. The data do not include a number of purely bargaining cooperatives (nonhandling) in fluid milk markets that carry on various activities in bulk milk development programs reported under the proprietary firm category. The number of firms in the two categories functioning only as milk processors without distributing fluid milk was an insignificant part of the total.

Practically every major type of specific milk handling operation was represented among reporting plants receiving bulk farm milk. Appendix Table 6 gives the breakdown of the firms according to specialization in processing operations, with corresponding numbers of farm tanks installed among patrons. About 80 percent of all plants with 84 percent of all farm tanks are classed primarily as fluid milk distributors and receiving stations directly associated with this type of operation. In the North Central States, however, over 34 percent or 14 strictly processing or manufacturing firms were receiving from 177 farm tanks.

Plants Totally Converted to Bulk Handling

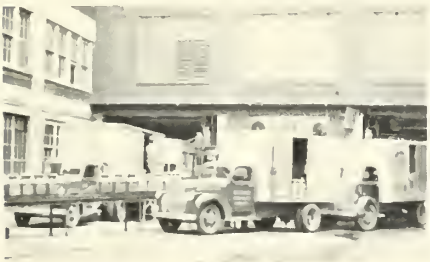
Table 3 summarizes information on the eight firms receiving all milk by farm tank assembly. All were in the fluid milk distribution or distribution and processing fields and were scattered throughout 5 regions. Every plant owned and operated its own tank trucks and routes.

The largest plant in the group had a total of 34 patrons delivering an average of about 54,000 pounds of milk daily for the month. The smallest firm reported but 6 patrons. On the average the 5 firms reporting volume data received about 1,000 pounds daily per farm.

On the average the complete shift to farm tank pickup required but 8 months for this small sample. The size of herds and frequency of farm tank milk collection varied considerably.

Plants With Dual Operations

Information was obtained from 89 plants that reported receiving some milk from producer-patrons in cans and some by tank assembly. Material differences existed among these plants with respect to comparative volume levels of the tank and can patronage groups, daily average farm deliveries, and degrees of conversion to the bulk system.



Many plants receive milk both in bulk and in cans. This is typical scene of pickup truck unloading cans at receiving plant.

In most cases, these were large-volume firms experiencing a gradual but slow shifting of producer-patrons to the tank assembly system. Some of these operators reported that thus far during the change-over period, average total per hundredweight costs of procurement and plant receiving could not be materially reduced, if at all. A few indicated that such overall unit costs on the average had increased slightly. It appears probable that disruption of can pickup routes, the fixed nature of many can receiving costs, and the charging of premium or "subsidy" payments to haulers and producers as expense during the transition would explain most of these observations.

Volume from Tank and Can Shippers

Table 4 gives comparative information from the 89 reporting plants with dual receiving operations. The daily delivery per shipper averaged 1,015 pounds of milk for tank, 525 pounds for "graded" can, and 210 pounds for "ungraded" can. Tank volume accounted for 20.8 percent of total volume and 9.0 percent of patrons; "graded" can, 59.3 percent of volume and 49.5 percent of patrons; and "ungraded" can, 19.9 percent of volume and 41.5 percent of patrons.

Producer data are given in separate averages for "graded" and "ungraded" shippers. The "graded" milk shipper category includes all producers inspected by health authorities holding local jurisdiction for delivery of market milk of first quality. All "ungraded" milk shippers comprise the other broad group including such grades as "B" and "C" and all other producers delivering milk classified as "manufacturing-grade" or "factory" milk.

In the East North Central region, several processing plants reported all their tank shippers as "Grade B." Table 4, however, includes all bulk milk shippers in the "graded" milk category. The distinction was made to permit realistic volume comparisons of tank and can shippers of comparable "grade" or market status.

Comparative volume data were reported by 89 plants in 7 regions for a combined total of 2,202 tank shippers, 12,081 "graded" can shippers, and 10,115 "ungraded" can shippers. The combined milk receipts of these plants during the month were nearly 332 million pounds from 24,400 patrons. This volume represents total average daily plant receipts of about 120,000 pounds and average daily farm deliveries of 438 pounds from all patrons.

Table 4.—Comparative levels of patronage, plant volume, average producer deliveries, and degree of conversion among reporting plants for tank and can "graded and ungraded" milk, by regions, May 1953

Item	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	Mountain	Pacific	U. S. totals [2]
Number of firms reporting dual operations	11	11	8	26	9	10	14	89
"Graded" tank milk:								
Total number of shippers	[1] 221	156	274	497	80	178	796	2, 202
Total number of tank trucks	20	14	28	41	8	17	46	174
Total receipts for month—million lbs	8. 6	6. 0	11. 2	13. 4	2. 5	7. 7	19. 9	69. 3
Average daily delivery per shipper—lbs	1, 259	1, 246	1, 310	868	990	1, 393	807	1, 015
Conventional can milk:								
"Graded" can milk:								
Total number of shippers	829	3, 030	1, 719	3, 450	597	1, 090	1, 366	12, 081
Total plant receipts for month—million lbs	13. 2	41. 3	40. 7	52. 2	8. 2	17. 1	23. 9	196. 5
Average daily delivery per shipper—lbs	513	440	763	488	442	508	564	525
"Ungraded" milk:								
Total number of shippers	------	------	------	2, 833	2, 677	789	3, 816	10, 115
Total plant receipts for month—million lbs	------	------	------	25. 8	22. 3	2. 8	14. 9	65. 8
Average daily delivery per shipper—lbs	------	------	------	294	269	114	126	210
Total "graded" milk receipts:								
Percent volume in tanks	39. 6	12. 7	21. 6	20. 4	23. 1	30. 9	45. 5	26. 1
Percent volume in cans	60. 4	87. 3	78. 4	79. 6	76. 9	69. 1	54. 5	73. 9
Total "graded" milk shippers:								
Percent patrons in tanks	21. 0	4. 9	13. 7	12. 6	11. 8	11. 3	36. 8	15. 4
Percent patrons in cans	79. 0	95. 1	86. 3	87. 4	88. 2	88. 7	63. 2	84. 6
Percent tank milk of total plant receipts	39. 6	12. 7	21. 6	14. 6	7. 5	27. 8	33. 9	21. 0

[1] Includes some "certified milk" producers.
Excluding California and Florida.

Volume and Conversion Patterns

The consistent pattern of substantially larger deliveries by the tank producers was evident in each regional average comparison. In no instance did a plant report larger average per farm deliveries in cans than in tanks.

The lowest regional average daily shipment of 807 pounds for tank shippers was at reporting plants in the two Pacific States. This level represented the narrowest range, regionally, between the average tank and average "graded" can deliveries. Probably these figures partially reflected the greater proportionate degree of conversion to bulk handling that has occurred among plants in these two States. Moreover, 36.8 percent of total "graded milk" patrons and 45.5 percent of total "graded" milk volume were in bulk. These averages were proportionately much greater than for any other region.

Producer pouring milk at about 97° F. into strainer emptying directly into farm bulk cooling tank.

Different types of plants, varying degrees of conversion, short run production conditions, and unusual seasonality patterns are several factors that can affect this type of average computation. Nevertheless, the data show that the deliveries by tank shippers were nearly double those of can producers.[7]

The larger producers usually comprise the more specialized, progressive, dairymen, use more modern methods, and possess financial reserves and credit resources that facilitate the substantial individual investments necessary for bulk tank equipment. This is not the whole story, however, since unequal response to new techniques reflects in part unequal potential benefit, and the comparative advantage of size.

Farm Aspects of Bulk Handling

Size of Milking Herds

Data submitted relative to average size of milking herds on farms of both bulk and "graded" can milk patrons lead to interesting comparisons. These data summarized in Appendix Table 7 show that nationally, average size milking herd of the bulk shippers is nearly double that of the "graded" can shipper. This ratio varies but little from the national average per farm volume comparisons shown in Table 4 on page 14.

The range in average herd size of bulk milk shippers reported by

[7] In November 1953 average daily milk deliveries for all 1,904 members of Connecticut Milk Producers Association, Hartford, were 508 lbs. The 214 member producers equipped at that time with farm bulk tanks averaged 1,304 lbs. per day. In terms of 10 gallon cans these deliveries would be about 6 and 15 cans, respectively. (DAIRY MARKETING by Stewart Johnson, Dept. of Agr. Ec. and Farm Management, College of Agr., University of Connecticut, Storrs, Jan. 1954.)

firms was from 18 to 150 milk cows, and for can shippers from 10 to 60 cows. For all bulk milk shippers the average size of herd was 40 cows for 84 reporting plants; the "middle" figure was 35, and the "most common" number was 30 cows. The average size of herd was 22 for can shippers, with 20 being both the "middle" and the "most common" figure. Can producers at reporting plants outnumbered bulk shippers by about an 11 to 1 ratio. From the sample of 84 plants all but 12 reported average size of herd among their bulk producers as larger than average herd size of can shippers by greater than 8 cows. One plant gave equal averages for both categories of producers, but in no instance did the herds of can shippers average larger than those of the tank shippers. In most cases, the regional average size of herd of both bulk and can shippers at reporting plants was substantially larger than the Census regional average herd size on all U. S. commercial dairy farms. (Appendix Table 2, page 36.)

Bulk milk is commonly collected at from 34° to 38° F. Upper picture shows filled farm tank with submerged agitator and measuring rod. Lower picture shows tank truck operator reading volume of milk in farm bulk tank from calibrated measuring rod.

Volume Capacity of Farm Tanks

Rated holding capacities of farm bulk tanks installed varied considerably among and within most regions. The producers' choice of size of farm bulk tank was affected primarily by three principal factors:

1. Present herd size and anticipated production at peak season.
2. Frequency of tank truck collection service.
3. Individual dairyman's estimate of future changes in size of his herd.

Farm tank capacities vary somewhat among makes and models but are available in sizes ranging from a low of 60 gallons up to 1,500 gallons or more.[8] In the smaller sizes, additional capacity is available in units of 50 gallons and at the medium and larger sizes in units of 100 gallons. In general, manufacturers appear to have standardized on the practice of providing an additional *actual* capacity of between 5 and 10 percent above the *rated* capacity.

A detailed inventory of farm tank sizes among all bulk shippers was not obtained. However, Appendix Table 8 summarizes the range in farm tank sizes among shippers to reporting firms, as well as the typical sized tank installed, among these producer groups. The most popular size of farm tank was the 300-gallon unit. Nearly 90 percent of the firms reported the three sizes of 200, 300, and 400 gallons together, as the most frequent installations. Twelve plants

[8] A gallon of raw milk testing 4 percent butterfat at a temperature of 50° F. weighs approximately 8.60 pounds.

indicated that the 150-gallon unit was the most typical installation. This capacity was also the smallest size reported as a plant average. Eight of the latter twelve reporting firms were located in the East North Central region. Plants reporting the smallest size tank installation among patrons at 100 gallons of capacity or less numbered 28. About two-thirds of all plants reported the largest size tank at 500 gallons or higher, while only 4 plants reported the typical size tank at this capacity or larger.

Basic Farm Tank Refrigeration Systems

Except for rather minor technical variations, only two major types or systems of refrigeration are commonly used with farm bulk milk tanks. One is the "cold-wall direct-expansion refrigerated;" the other is usually termed "ice bank, sweet-water refrigerated." No attempt will be made to describe the construction, method of operation, advantages and merits, or comparative initial, operating, or total costs of either general type. Both groups of tanks have come into more or less popular usage, but to varying degrees in different production areas. In many production areas some farms are equipped with one general type of tank and some with the other.

Nearly 20 equipment manufacturing firms are now producing farm bulk milk cooling tanks. These tanks vary considerably in appearance, design, materials, capacity, and price as well as in other technical features. Because of these differences, it appears probable that tanks vary somewhat in overall cooling efficiency, durability, longevity, and general performance. All tanks are designed basically to provide for rapid milk cooling and constant low holding temperatures until time of pickup. Some firms also produce various types of mechanically refrigerated farm can coolers; others manufacture specialized lines of equipment for use in dairy plants.

This circular does not include a detailed breakdown of farm tank installations by brand name, or between the major refrigeration types. Appendix Table 9, however, compares predominant installations of the two principal refrigeration systems by reporting plants on a regional basis.

Part of the indicated pattern of farm tank installations apparently arises from the practice of some manufacturers to concentrate or possibly confine much of their sales effort to one or more regions or States. Moreover, not all present manufacturers began production and distribution at the same time. Considerably more firms manufacture the cold-wall type of tank than the other main type or sub-types.

Milking Parlors and Pipelines

Some farm management experts and dairymen regard the farm bulk milk tank as the third major link in labor efficiency of milk production under present technology. They maintain the farm tank functions as a natural element of a 3-way integrated modern installation of parlor, pipeline, and tank. Converting a conventional stanchion barn, bucket-type milking layout to a parlor-closed line system involves a substantial capital investment, regardless of whether 10-gallon cans or a bulk tank are used for storage.

In some fluid milk markets, health departments and sanitation agencies have withheld formal approval of certain of these installations. However, dairymen in a number of other areas are adopting various parlor-pipeline systems (with bulk cooling tank).

Appendix Table 10 reports the extent of current use of these combined facilities. The inventory

detail does not include those parlor or permanent pipeline installations on farms of can shippers.

No single firm in either the New England or Middle Atlantic regions reported over two parlor and pipeline milker installations among bulk shippers. In the South Atlantic region one plant reported 6 combinations out of 8 and another firm reported 8. In the East North Central area one plant reported 8 out of 10 and another 5 out of 6. Among 63 reporting plants, about 14 percent of the 2,016 farms having bulk cooling tanks also had milking parlor and pipeline milker system.

Specific Plant Policies and Practices

PLANTS have devised a number of special changes in conventional plant policies and practices to accompany the changes in techniques and facilities in adopting a bulk milk program. These emerging patterns reflect some of the effects of production technology upon the functioning of the marketing structure.

Among the practices followed by plants aggressively promoting the system are purchasing and reselling farm tanks, assisting with producer installations, assuming ownership and control of trucks and routes, financing, and disposing of obsolete equipment. Other policies are paying premiums for farm tank milk not specifically related to quality, changes in milk pickup schedules, and charging lower hauling rates on bulk pickup deliveries compared to can pickup.

The current survey undertook a broad appraisal of several of these significant trends. These practices varied considerably with modifications from area to area and plant to plant. Nevertheless, their existence and wide application directly reflected the interest of the firms. The firms translated this interest into policies designed to encourage and protect the transition to bulk handling, particularly in the initial or experimental stages of development.

In many cases, once precedent was established within a restricted market area, the particular practice or principle held rather steady. Plants further modified their initial plant policies, however, to assure continuance of a satisfactory response to change from haulers and producers, or to meet competitive pressures of other firms or demands of producers during the transition period.

Equipment Purchases and Financing

Farm bulk tank installations generally begin in most areas either from a concerted demand by a number of the larger patrons for tank truck pickup or by a positive plant policy of direct promotion. After a certain point has been reached, these two basic forces generally merge in practice as the changeover gains momentum and new areas convert to the new methods.

Plant employee of a Wisconsin cooperative dairy enters interior of 1,500 gallon farm truck tank with cleaning equipment, following pump-out and cold water rinse. A final chlorine rinse under pressure sanitizes the tank for the next delivery.

Producers obtain the use of farm bulk cooling tanks in a variety of ways. It is not uncommon for individual producers to contact or to be solicited by field representatives of farm tank manufacturing firms. The "isolated" tank producers could then draw off the milk daily into cans from the bulk tank by gravity or pump and ship to the plant in the conventional manner. Eventually, these and other interested producers may request the plant to provide tank truck collection service. Or the plant may assume the dominant role in expanding the initial operation. These patterns may be varied or modified depending largely upon producer and hauler reaction and degree of initial response.

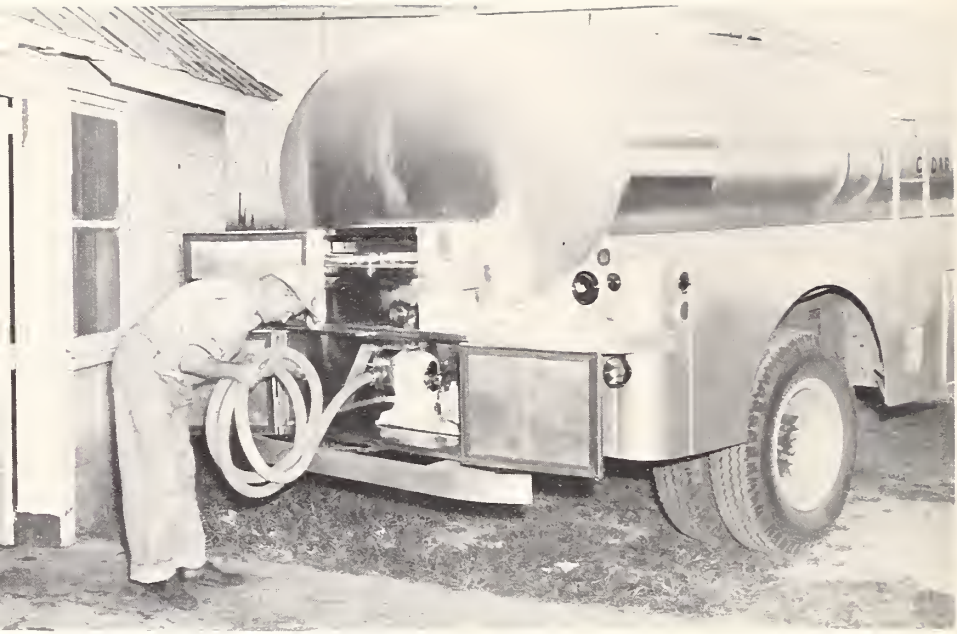
More typically, however, once the new techniques have been introduced on a limited scale, the plant assumes the major aggressive role in encouraging producers to consider a shift. In many cases, plants have achieved progress in the developmental stages by adopting and publicizing certain practices designed to make conversion more attractive to a larger group of producers. Included among these practices is financial assistance to producers in acquiring farm tank equipment. This assistance may be a direct "subsidy" or indirect aid of several forms.

Some plants, after obtaining a number of orders for bulk tanks from producers, will purchase in carlot quantities from one or more manufacturers and resell the equipment to producers. At times, plants pass on to producers savings realized from volume discounts on such quantity purchases directly in the resale tank price. Net resale prices may or may not reflect a charge for plant handling costs. In other instances the plant retains the discounts to help defray the cost of or to underwrite the actual farm tank installation, calibration, and initial servicing costs.

Tank truck operator as employee or agent for the milk plant reads calibration chart after measuring farm tank volume to convert gallons to pounds. He then writes a duplicate receipt for producer and plant.

Occasionally the plant may purchase farm tanks in quantity from manufacturers or jobbers for its own account, retaining ownership of the equipment by installing and leasing it to producer-patrons. The plant thus directly assumes the initial financing burden, subsequently shifting it in whole or in part to participating producers through rental charges for facility use. Twelve reporting plants followed this practice. They quoted initial rental charges at 3, 4, and 5 cents per hundredweight. When plants choose to own farm tanks, they usually maintain continuing financing arrangements directly through the equipment manufacturer, or establish a special line of credit directly with a commercial lender. There is a definite limit, however, as to how far most plants could expand such a program.

In addition to the above forms of initial financial assistance or arrangements, plants may also accept the producers' can cooling equipment as a full or partial down payment. The plant may then assume title to and responsibility for disposal of such equipment. Some plants report that losses have been sustained in handling the used equipment.



After the pump-out of milk from the farmer's tank to the tank truck, the driver rolls up the hose as he prepares to leave a Maryland farm.

Similarly, in reselling tanks and compressors to producers, the plant may assume the direct banking function for certain farmer buyers. A plant may arrange similar or somewhat more favorable financing terms than the producer might obtain individually at a commercial lending institution, particularly if it acts as co-signer of the patron's note.

A much more common plan perhaps is for the plant to arrange, on behalf of interested patrons, a blanket program with one local commercial source of credit. The financing is then generally covered under terms of a conditional sales contract directly between the bank and the producer. The plant remits agreed-upon monthly deductions or installments from proceeds of milk sales covering interest and principal to the bank through an assignment executed by the producer for this purpose. Local production credit associations and regional banks for cooperatives among other credit institutions are now participating in several forms or variations of these joint financing programs.

The current survey did not measure the extent or precise nature of these various practices and their modifications. Table 5 gives the location and degree of farm tank purchase, sale, and leasing practices and the general extent of initial financial assistance provided producers by plants in acquiring farm bulk milk tanks.

Nearly one-half of all reporting plants indicated they were purchasing farm tanks direct from manufacturers and reselling them to farmer patrons. Practically all of these firms also provided some form of direct initial financial assistance in this connection. Sale of tanks directly to farmers holds no appeal to the majority of tank manufacturers because of the high sales costs involved.[9] Also some manufacturers are apparently unable to

[9] Myrick, Norman. WHERE DO WE STAND AFTER FIVE YEARS OF BULK HANDLING. American Milk Review. Volume XV, No. 9. Sept. 1953. p. 12.

offer reasonably satisfactory finance terms in substantial amounts to all sales prospects. Accordingly, a number of farm tank manufacturers have established distributor and/or dealer agencies in rural communities to sell direct to plants and/or farmers. This practice will tend to relieve the manufacturer and dairy plant of installing and servicing the equipment. These functions may thus be shifted to local farm implement or appliance dealers who make the sale and remain in position to give prompt, expert servicing. This development may also tend to relieve the plant of a possible incidental burden in disposing of can-cooling equipment and farm tank trade-ins and exchanges; and it may tend to increase the initial basic cost of the new equipment to the producer.

Financing Plan

Some cooperatives may eventually find it possible as well as practicable to study carefully and plan ahead for a program of mass conversion of producer members from cans to tanks on a controlled basis. Such a program would seem to require, among other things, voluntary member endorsement of proposed objectives and procedures, dealer and hauler cooperation, and adequate financing in order to expedite the transition and maximize savings and benefits.

Under one plan now being considered by a large dairy cooperative, the association would select possibly two or three makes of tanks and purchase these in carload quantities to lower initial cost and simplify future servicing. Following a complete field survey to determine each producer's preference, expected volume, and tank size, commercial financing would be sought to enable the cooperative to purchase and install the equipment on farms over a two- or three-year period. An attempt would be made to shift producers from cans to tanks by groups in concentrations within an area before proceeding to develop new routes.

This tentative proposal would provide that the cooperative purchase and temporarily retain title to all farm tanks for its own account. It would require that all projected monetary savings accruing to the association be carefully estimated

Table 5.—Location and general extent of farm tank purchase, sale, leasing and initial financial assistance [1] provided producers by plants, by regions, June 1953

Region	Number of firms reporting	Number of plants that purchase and resell farm tanks to patrons		Number of plants that purchase, install, and lease tanks to patrons		Number of plants that provide some direct initial financial assistance to producers purchasing tanks	
		Yes	No	Yes	No	Yes	No
New England	12	4	8			3	9
Middle Atlantic	14	6	8	4	10	6	8
South Atlantic	7	1	6		7		7
East North Central	31	17	14	3	28	15	16
West North Central	10	4	6		10	3	7
Mountain	11	8	3	1	9	8	3
Pacific	17	9	8	4	13	11	6
United States	102	49	53	12	77	46	56

[1] Exclusive of premium payments for milk, direct reductions in hauling charges, or tank hauling "subsidy" payments.

in advance, assuming a certain rate of conversion and volume. In some cases the overall debt contracted by the association might be amortized on a reasonable basis from retained operating savings realized from reduced receiving and hauling costs and elimination of milk cans, and possible dealer-handler quality or other premium payments for any milk delivered to them. Producers could sign an agreement authorizing the association to deduct and withhold from each member's share of the milk pool, his proportionate share of such actual savings realized by the association in marketing his bulk milk.

Such funds, with or without a regular additional modest tank rental deduction from producers, could be available to retire the association's indebtedness over a period of years. Each producer's proportionate share of the savings could then be credited to his individual "Bulk Tank Equity Reserve Account" on a patronage basis. Installation and maintenance expense as well as interest cost to the association on borrowed capital would be charged against these accounts. If the credit balance of a producer's account equaled the cost of his bulk tank, he could then be given title to it by canceling his equity in such reserves. If the association had liquidated its contract debt for the tanks, any additional savings realized and credited to the equity reserve could be added to the milk price paid to members who have already earned title to their tanks. Special provisions would be required for members who, after a period of time, need a larger tank, retire from dairying or move from the area.

Such a program, or modifications of it, would have to be carefully considered and adapted to the particular circumstances and opportunities surrounding a given cooperative and its members. A sizable line of credit on rather favorable terms would appear essential to the institution and successful operation of this plan. It is not known whether any cooperatives are actually operating along the lines of the above program at this time.

Price Premiums for Tank Milk

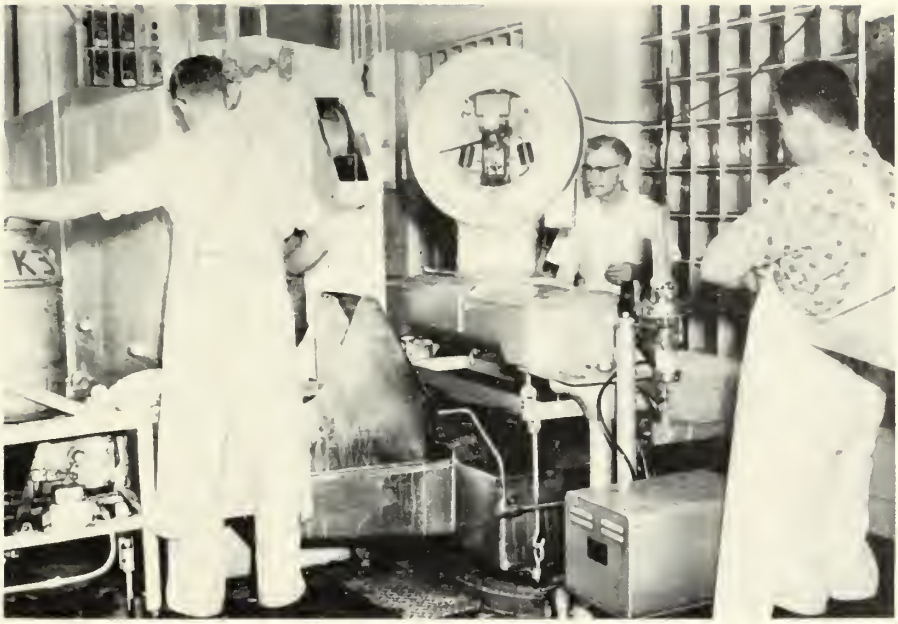
Many receiving plants paid price premiums not specifically related to milk grade or quality to all bulk milk shippers. Of the 98 firms reporting, 45 percent paid such premiums for bulk farm milk. Nearly 64 percent of those paying premiums reported the amount at from 5 to 10 cents a hundredweight. About 24 percent of the firms reported premiums of 15 cents or more.

Premium or "bonus" payments of varying amounts per 100 pounds over and above unit prices paid to can shippers were a fairly common practice. In most cases the premium payments started at the very beginning of the bulk milk program. Moreover, as the conversion progressed there appeared to be no tendency to either increase, reduce, or remove such premiums. Thus most producers, both can and tank, tended to view them as a fixed part of their total returns.

Adoption of this policy probably reflected the response of the milk buyer to one or a combination of the following circumstances. These circumstances varied in nature and degree depending largely on local conditions:

1. Plant determination of potentially favorable economies under complete tank operation. This resulted in a policy decision to expedite or make possible this conversion by indirectly and partially subsidizing the bulk shipper's initial required investment in equipment. This policy generally reflected an estimate of future economic gain based on the individual evaluation of management.

2. Plant reaction to pressure orig-



Receiving Grade A milk in cans at Watertown, Wis., plant of Dairyland Cooperative Association, Juneau, Wis.

inating from organized producer bargaining groups, or individual producer demands for direct assistance in the form of price favoritism.

3. Plant decision to "meet or beat" direct competitive pressures from other firms offering certain price or other forms of tangible inducements to bulk milk shippers.

4. The willingness and ability of some firms to pass on to bulk milk patrons some portion or all of the tangible economies realized in assembly and receiving at certain stages in the transition period. Not all plants, however, advise producers in advance that such premium payments might not be permanent.

Other plants may logically justify some portion or all of such price premiums directly on improved product quality. One almost universally reported benefit of the bulk handling system is its effect on milk quality. However, when small amounts of tank milk are blended with a greater volume of can milk receipts, these benefits are difficult to evaluate in terms of immediate monetary advantage to the buyer. The benefits in this instance would appear to reflect present recognition of future possible increased market returns or greater consumer acceptance of product. In some instances distributors have brought improved quality of the milk to the attention of consumers through local advertising.

The practice of premium payments follows a fairly consistent pattern in "graded" milk markets. The level may be voluntarily established by the pioneer firm, or gained by the producers' bargaining association on a marketwide basis. In the absence of the latter, it is reasonable to assume that as patrons of additional plants within the market or contiguous markets respond, the level of such premiums will tend to become stabilized. Thus the prevailing and historical intra-market and inter-market price relationships will be reestablished. Eventually, however, when conversion has reached a certain point, such pre-

449130 O - 58 - 4

Table 6.—Number of plants paying direct price premiums to bulk milk shippers and amount of such premiums per hundredweight of milk, by regions, June 1953

Region	Total number of plants reporting	Number of plants paying premium [1]	Number of plants not paying premium	Percent of plants paying premium	Plants paying premiums per 100 pounds of milk of—					
					Less than 5 cents	5 cents	6 to 9 cents	10 cents	15 cents	Over 20 cents
New England	12	7	5	58.3	------	5	------	2	------	------
Mid Atlantic	14	4	9	28.6	------	1	------	3	------	------
South Atlantic	7	------	7	------	------	------	------	------	------	------
East North Central	28	13	15	46.4	1	2	2	3	4	1
West North Central	9	4	5	44.4	------	1	------	3	------	------
Mountain	10	1	8	10.0	------	------	------	------	------	------
Pacific	18	13	5	72.2	------	------	1	6	5	1
United States	98	42	54	42.9	1	9	3	17	10	2

[1] Two plants did not report the amount of price premium paid.

miums may be reduced or disappear entirely. Should local production increases be encouraged as unit farm costs decline, the transitional premiums may either be transferred to benefit consumers in lower prices or absorbed by established elements in the marketing channels.

Table 6 shows the number of firms making premium payments and the amounts paid by plants on a regional basis. The practice was most prevalent in the Pacific Northwest. However, no firms reported payment of these premiums in the South Atlantic region. A few firms follow a monthly or variable premium policy directly related to changing producer basic price levels in overlapping or competitive milksheds.

Ownership and Operation of Hauling Facilities

Policies and practices of reporting firms relative to ownership, operation, and financing of milk assembly trucks appear in Appendix Table 11.

Among the dual-operation firms one-third owned and operated some can pickup trucks. Nearly two-thirds of the same group of firms owned and operated some or all farm tank pickup trucks. Sixty-five plants owned and operated no can trucks while 36 firms receiving farm tank milk owned no tank trucks delivering to their plants. Thus there were 22 reporting firms owning tankers but no can trucks; on the other hand, only 3 firms owned can pickup trucks but no farm tank trucks.

The data indicate a trend toward continued plant ownership and operation of hauling with tank trucks, as well as a tendency for plants to shift from "for-hire" can hauling to ownership and operation of bulk milk collection facilities. These observations perhaps reflect two principal points of view:

1. Plant willingness to own and operate tanker transports in order to assure complete control over pick-up procedure, routing and service, product quality, sanitation, and patron relations, or to provide collection service at lowest possible cost.

2. Hesitancy, difficulty, or inability of "for-hire" can haulers in some areas to obtain suitable financing for tank truck equipment, and to assume the risk of substantial investment and settlement terms for route equities of other "for-hire" can haulers absorbed in a new tanker route. There may also be other reasons to explain such hauler reaction.

About one-fourth of all firms utilizing services of "for-hire" tank truck operators provided some direct initial financial assistance to such haulers as an aid in establishing bulk farm pick-up on this basis.

In some instances when a plant shifts to ownership of hauling facilities in the early stages of its bulk milk program, it may thus eliminate a traditional costly structure of can-hauling subsidies. At the same time such action tends to put all haulers on much the same basis, giving the plant a greater degree of continuing freedom in reorganizing and consolidating pickup routes, thus avoiding pressures from remaining "for-hire" haulers for special treatment as the route structure undergoes revision during the transition period. Similarly, the probable effects of current or future organized labor activity among tank truck operators may affect the final decision of the individual plant.

Appendix Table 12 summarizes detailed information obtained regarding the extent of ownership of all farm tank pickup trucks by plants, haulers and producers for all plants surveyed. Plants owned and operated about 49 percent, "for-hire" haulers 44 percent, and producers themselves, 7 percent of all tanker transports in operation. The pattern of ownership and operation

among the regions varied considerably.

Type and Capacity of Tanker Transports

There are essentially two main types of farm-to-plant bulk milk hauling equipment. The oval or elliptical transport tank may be mounted on either (1) a straight-frame truck chassis or (2) a trailerized design powered by a heavier gasoline or diesel tractor. The unit may be either single or tandem axle.

Appendix Table 13 gives an inventory breakdown of existing tank hauling equipment by structural types and volume capacity.

Considerable variation existed both among and within the several regions in types and sizes of operating tanker transports. The most popular unit was the 1,500 gallon tank mounted on a straight-frame truck. This assembly accounted for nearly 30 percent of all transports reported and 40 percent of all straight-frame tankers. It represented the most common size of straight-frame job in all four Western regions and is also common in all Atlantic Coastal areas, except New England.

The 2,500 and 3,000 gallon trailer tanks accounted for 60 percent of all reported trailerized units in operation. Only 6 of this type unit carried rated holding capacities of under 2,500 gallons, whereas 8 had rated capacities of over 3,000 gallons.

Use of the smaller size tankers of 1,500 gallons or less is more frequent in the North Central region than in any other area. Forty-two, or 82 percent, of all straight-frame transports were in this category in the two North Central regions.

Regional preference applied also to the tank construction, design, number of milk compartments, baffle plates and pass-through, agitators, manhole assembly, pump-out and sample cabinet, pump, hose, and other miscellaneous features desired. Local decisions partly determine the overall utility and economy of the system used.

Probably some of the tankers were purchased partly on the basis of their availability at the time purchase decisions were made.

As far as is known, only certain areas in California combine a tank trailer and can van trailer, powered by the same heavy-duty tractor.

Several local circumstances in bulk farm pickup ordinarily deter-

Type of farm tank truck widely used in the Midwest pictured at plant of Rochester Dairy Cooperative, Rochester, Minn.

Trailerized farm tanker transport at Dairymen's League Cooperative Association, Inc., Niagara Falls, N. Y., plant.

mine the size and type of truck tank and hauling unit:

1. Can pickup trucks in good condition, regardless of ownership, that may be retained for mounting a tank. The size of tank accommodated by many can truck chassis and frame is often limited to a range between 1,000 and 1,800 gallons. This capacity may at times be increased up to a maximum of about 2,500 gallons by installing dual-axle equipment on some straight-frame units. If a new truck is to be purchased for the operation, the tank type and capacity may be patterned to the power and maneuverability desired or vice versa. Farm transport tanks are available in various sizes from 500 to 2,000 gallons for mounting on a straight-frame, single-axle truck, and from 2,000 to nearly 5,000 gallons in trailerized design. At least half a dozen firms are producing this type of equipment.

2. Factors limiting choice of tankers may be the type and condition of roads, bridges, farm lanes and yards, topography, climatic conditions, governmental weight and load restrictions and enforcement practices. These circumstances may govern the choice of unit in terms of weight, traction, maneuverability, and in relation to special seasonal problems.

3. Financial aspects of the tank truck investment and operation may affect type and size of hauling unit selected. Total investment is substantially greater for the larger, trailerized transports and the heavier-powered tractors needed to pull them. Fixed costs of ownership as well as certain variable costs are somewhat higher on these larger units. They may be less practical in an area of many small producers who are not concentrated enough to form reasonably compact collection routes. They are considered more practical, however, for longer over-the-road hauls from the supply area to the plant.

4. Many plants and haulers experiment in the trial or early developmental stages with a small tanker unit to serve a few patrons. With satisfactory experience, they acquire larger units for subsequent expansion of the program. Thus the smaller transport provides more flexible service in the initial stages of development in new procurement areas and later can also function as emergency or standby equipment.

Larger plants, particularly those located in primary markets, drawing supplies from an extended area, and facing future expansion of tanker assembly, may consider using larger trailerized units to receive, by trans-

fer at a country concentration point, milk collected by several smaller "feeder" farm tank trucks. Some existing country receiving and cooling stations eventually may thus be bypassed. Several areas of the Pacific Coast States now use this system to some extent.

Tank Milk Collection Schedules

A total of 50, or about one-half of all the plants, reported receiving all milk on every-day pickup schedules. However, only 26, or about one-half of this number reported that health or sanitation agencies restricted pickup to an every-day basis. The other one-half apparently had instituted and adhered to a consistent every-day collection policy voluntarily. Four other plants reported that health department waivers or special permits had been obtained to justify every-other-day pickup. Several firms also indicated local or State laws and regulations were silent with respect to the matter of frequency of farm tank pickup.

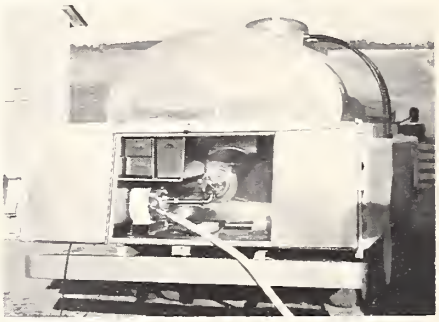
The comparative economies of *every day*, *every-other-day*, five days a week, every third milking, every third day, and similar mixed patterns of collection are not clear under all circumstances and at all stages of the process. On the whole, however, economies appear to favor the delayed bulk collection methods compared with daily tank or can pickup.[10]

The collection pattern adopted vitally affects plant receiving, cooling, storage, and farm capital and cooler operating costs. Unit capital costs of farm transport are lower when the collection frequency, route structure, and volume per patron permit greater flexibility through the more complete use of hauling facilities.

[10] Baum, E. L. and Pauls, D. E. A COMPARATIVE ANALYSIS OF COSTS OF FARM COLLECTION OF MILK BY CAN AND TANK IN WESTERN WASHINGTON, 1952. 37 pp. Washington Agr. Expt. Sta. Tech. Bul. No. 10, p. iv. Pullman. May 1953.

There is a good deal of evidence that bulk milk collection may considerably modify traditional daily can pickup schedules. However, health and sanitation authorities do not all agree that other than daily pickup of tank milk is feasible from the standpoint of quality and consumer interest.

In some markets, milk plants and producer groups have voluntarily chosen to continue the conventional practice of every day deliveries in planning a bulk milk assembly program. In other areas, plants have introduced flexibility in collection procedure immediately upon instituting the system.



Plants may vary their farm pickup schedules in different areas. These schedules range from every day pickups to three times weekly.

Appendix Table 14 summarizes survey findings on the nature, extent, and location of various flexible collection practices in bulk milk procurement programs.

All regions except one showed wide variation in frequency of collection among reporting firms. Nearly all plants located in the two Pacific States indicated that year-around every-other-day pickup schedules for tank assembly routes were in effect.

As the program expands within individual areas, these initial patterns of collection are not likely to shift quickly because of certain inherent rigidities. Most important in this connection is the fact that farmers' bulk milk coolers, when

installed, are generally geared by size to a predetermined collection schedule.

If a subsequent shift was desired to every-other-day from every day pickup, in some months many farmers' tanks would lack capacity to hold the milk from four milkings. This problem would be further aggravated if herd size and production levels had been expanded during the interim. Shifting of tanks among farms and reinstallations would result in considerable expense and possible disruption of the program. If every-other-day routes, either by compulsion or for some reason, were to be shifted to an every-day pickup basis, many producers would then likely be confronted with excess tank capacity for many months on which the fixed costs of ownership could become somewhat burdensome. Some managers reported a tendency on the part of many producers to increase their volume of production after installing the farm tank. Farm tank size should be geared to anticipated future production levels as well as to a definite procurement and collection policy.

Certain midwest manufacturing plants for example followed a mixed pattern of collection where frequency of pickup was not specified by health authorities. For a large group of these routes, every-other-day pickup was the general rule, but in the flush season it became necessary to pump out most farm tanks daily for a 3- to 6-month period. This pickup, of course, was governed by the individual producers' seasonal production and changes in size of milking herd after installing the bulk tank. Some firms reported that initial pickup was on an every-other-day basis only until additional producers joined the route to make a full tanker load with daily collection.

Various factors operating in some market areas have at least temporarily retarded adoption or unlimited expansion of the tank assembly method of procurement. At other points certain of these influences have prescribed specific operating procedures which, on the whole, may enhance the value of the final product, while at the same time affect economies unfavorably.

Bulk milk procurement also introduces a greater degree of flexibility through its adaptability to the multiple use of farm tank trucks. On an every-other-day collection schedule one tank truck covering one route each day makes but half the farm stops that a conventional can hauling unit does in the same total time period. Similarly with daily operation one tanker can be readily scheduled to cover two, or possibly more, routes—assuming a route to be equivalent to a load—with considerably greater ease than its counterpart hauling cans.

Table 7.—Extent of multiple-use of farm tank transports, by regions, June 1953

Region	Number of plants	Number of routes	No. of plants receiving 2 or more loads daily from a truck	Number of tank trucks delivering 2 or more loads daily to plants
New England	12	22	5	6
Middle Atlantic	14	24	5	5
South Atlantic	7	28	4	6
East North Central	32	49	9	14
West North Central	6	11	3	3
Mountain	9	18	3	3
Pacific	18	73	9	24
West South Central	1	1	----	----
United States	99	226	38	61

Additional flexibility is introduced both on the farm and at the plant. With more rapid cooling and steady low holding temperature of tank milk, the pickup can be accomplished almost at anytime except during milking hours.[11] The load usually can be transferred to storage anytime at the plant without regard to the 4 to 8 hour fixed receiving period commonly scheduled for can deliveries. It may be held over at the plant in the transport tank until morning with only a slight rise in temperature.

Thus, increased use of tanker facilities can be achieved with proper planning for scheduled multiple deliveries during each 24-hour period. This policy can be used to spread the total capital investment and fixed charges over a greater volume, thereby reducing total unit capital costs of procurement. During the transition period, however, it may be difficult to realize such potential economies when conversion to tanks is slow and disorderly.

Table 7 summarizes the extent of multiple-use of farm tankers by reporting firms. In each region, the practice is fairly common among certain plants that have progressed in converting producers beyond the initial plant route.

Hauling Rates and Differentials

A large proportion of reporting firms submitted information on current range and average of rates per hundredweight charged producers for farm-to-plant hauling in cans and in tanks, as well as plant subsidy payments to haulers, and total returns to haulers.

Tank hauling rates charged producers under both every-day and every-other-day collection averaged well below current rates for can pickup in the same area, irrespective of who owned and operated the hauling facilities. These tank milk hauling rates varied considerably in amount, but they did not exhibit the degree of variability in ranges and average values apparent in the can hauling rates.

Fixed charges for hauling service, as would be expected, varied widely for both methods of procurement among regions and among plants within the same region. This was apparent in the case of both company-owned hauling and "for-hire" truckers operating under contractual arrangements with either the plant or direct with producers. Appendix Tables 15 and 16 summarize the *can-hauling* rate data on a regional basis by the use of average values. Appendix Tables 17 and 18 give a comparable summary for *tank assembly* rates.

The rate data assembled in Appendix Tables 15, 16, 17, and 18 reflect average values of 80 firms reporting ranges and averages of current basic can-hauling and tank hauling rates, charges, and subsidy payments. While such rates did not necessarily reflect the true cost of the service provided in all instances, they served as general indicators of average comparative levels between the two groups of shippers within each procurement area surveyed. To this extent, a number of meaningful trends were apparent from a study of such rates and charges.

Among the dual-receiving plants surveyed, for every three firms reporting procurement from can shippers by "for-hire" haulers, *one* firm reported company-ownership and operation of hauling facilities. Of the "for-hire" group, one-third reported a flat-rate system of charges while one-half of the company-owned group had flat rates. Regional differences in these factors do not appear particularly significant. Differences in the range as well as average rates charged producers under the two types of

[11] A number of reporting plant operators stated that some producers objected to late evening or early morning pickup on the farms.

procurement also varied considerably within and among regions, as would be expected.

Under farm tanker pickup, plants directly handled procurement to a much greater degree than with conventional can procurement. Moreover, the system of flat rates or charges to producers prevailed in 60 percent of all cases reporting tanker pickup, and in but 30 percent of all areas reporting can collection.

Approximately the same total number of firms collected tank milk every day as collected on an every-other-day basis, but a number of firms indicated some of each type of collection within their existing procurement systems.

The payment of subsidies by plants to "for-hire" milk haulers occurred somewhat more frequently under the tank system, but the extent of this is obscured by the

Table 8.—Estimated average immediate monetary benefits realized by bulk milk shippers from specific policies in effect at dual-receiving plants by regions, June 1953

Plant and region	Amount of price premium payment for tank delivered milk	Average reduction in charge to bulk shippers for tank milk pickup	Combined cash benefits
	Cents per hundredweight	*Cents per hundredweight*	*Cents per hundredweight*
New England:[1]			
A	10	15	25
B	10	10	20
C	5	3	8
D	5	3	8
E	5	5	10
F	5	5	10
G	5	5	10
H	0	10	10
I	0	8	8
J	0	5	5
Middle Atlantic:[2]			
A	10	5	15
B	10	8	18
C	10	0	10
D	5	5	10
E	0	18	18
F	0	17	17
G	0	17	17
H	0	15	15
I	0	15	15
J	0	5	5
K	0	5	5
L	0	3.5	3.5
South Atlantic:[3]			
A	0	20	20
B	0	20	20
C	0	5	5
West North Central			
A	10	3	13
B	10	0	10
C	10	[4] 2	8
D	5	12	17
E	0	10	10
F	0	[4] 5	(5)

See end of table on following page for footnote references.

Table 8.—Estimated average immediate monetary benefits realized by bulk milk shippers from specific policies in effect at dual-receiving plants by regions, June 1953—Continued

Plant and region	Amount of price premium payment for tank delivered milk	Average reduction in charge to bulk shippers for tank milk pickup	Combined cash benefits
	Cents per hundredweight	*Cents per hundredweight*	*Cents per hundredweight*
Mountain: [5]			
A	15	0	15
B	0	20	20
C	0	7	7
D	0	3	3
East North Central: [6]			
A	20	3.5	23.5
B	15	2.5	17.5
C	15	0	15
D	15	0	15
E	15	[4] 3	12
F	10	2.5	12.5
G	10	0	10
H	10	0	10
I	7	0	7
J	7	0	7
K	5	8	13
L	5	3	8
M	2	0	2
N	0	20	20
O	0	15	15
P	0	10	10
Q	0	10	10
R	0	5	5
S	0	5	5
T	0	4	4
U	0	3	3
V	0	2	2
Pacific: [7]			
A	25	15	40
B	15	3	18
C	15	0	15
D	15	0	15
E	15	0	15
F	12	3	15
G	10	5	15
H	10	5	15
I	10	5	15
J	10	4	14
K	10	0	10
L	10	[4] 10	0
M	8	7	15
N	0	16	16
O	0	14	14
P	0	12	12
Q	0	6	6

[1] Excludes 1 firm receiving only tank milk and 1 firm with no average price or hauling differentials.
[2] Excludes 2 firms receiving only tank milk.
[3] Excludes 4 firms with no price premiums or hauling differentials, and 2 firms that did not report these items.
[4] Denotes increases in average hauling charges to bulk shippers.
[5] Excludes 1 firm receiving only tank milk, and 5 firms with no average price or hauling differentials.
[6] Excludes 2 firms receiving only tank milk, 6 firms with no current average price or hauling differentials, and 3 nonreporters.
[7] Excludes 1 firm receiving only tank milk. (All reported and all had in effect current average differentials.)

comparatively greater proportion of company-owned routes than under conventional can procurement. Moreover, the extent of any "hidden" subsidies absorbed by the plant under company-operation of hauling facilities is not known.

A consistent pattern of lower every-other-day rates than those for everyday tanker collection was not apparent in the data. Most of the firms reporting both types of pickup indicated that permanent differentials had not as yet been established.

Monetary Incentives Offered Bulk Shippers

Price premiums and hauling savings through bulk milk shipping brought average direct benefits to producers at 72 reporting plants of slightly over 12 cents per hundredweight of milk.

Table 8 gives a summary of estimated comparative tangible benefits accruing to bulk milk shippers arranged by direct price premiums in effect and hauling savings, both on an individual plant basis.

A total of 74 dual-receiving plants, including some in each major region (except the South Central) reported one or both types of direct financial benefits realized by their bulk milk shippers. The direct price premium or bonus paid varied from 5 to 25 cents per hundredweight. The most common premium was 10 cents per hundredweight. Forty-two of the 74 plants paid such premiums while in the case of the remaining 32 plants, the producers' immediate marketing advantage took the form of a reduced hauling charge from farm to plant.

Average reduction in hauling rates charged bulk milk shippers at 56 plants varied from 2 to 20 cents per hundredweight. The most common reduction was 5 cents per hundredweight. Fourteen of the 74 plants showed no average reduction in hauling rates charged producers under bulk pickup and 4 indicated bulk rates had increased slightly over previous levels for these shippers.

Thus the combined average direct benefit realized by tank producers shipping to reporting plants varied from a negative value (in 2 cases only) to a high of 40 cents per hundredweight. These incentive figures do not include any savings estimates that some producers themselves might realize by reason of lower unit capital and labor costs, or from reduced losses of milk volume and butterfat through bulk handling methods. All such potential benefits, however, should be of particular interest to cooperative dairy associations for their members.

Possibilities for Further Expansion

SEVERAL important factors affect the speed of the transition to bulk handling. These include educational and promotional efforts, attitudes and operating practices of numerous market institutions, industry competitive pressures, trends in farm prices and income, engineering and economic research, adequate and reasonable financing, and trends in prices of the equipment needed to apply the techniques.

Some proponents of the bulk milk program are extremely enthusiastic over recent expansion in nearly all areas of the country, and look toward a mass shift to new methods within a fairly short period, particularly among "graded" market milk producers and handlers. Other observers view present trends as a clear indication of a steady but gradual shift to the new methods, perhaps taking several decades. There is also a group that fails to see any universal or far-reaching success for the system unless a number of radical changes occur in

the present structures of dairy production and marketing.

The short-run future appears to present a problem in prediction. In any event, the impact of the change, applied or potential, does not affect the economic health of all the diverse groups in the industry—the plant, the truck operator, and the farmer—in the same manner or degree. Because of this, a policy of isolation by choice or indifference to change may be more marked in one group than another. Likely the extent, rate, and timing of future conversion will not depend solely upon a purely objective evaluation by all individuals affected of the relative merits of the new and of the conventional.

However, the basic strength of the shift to bulk handling appears to lie in its evolutionary nature. Individual experiences of plants and producer groups show this. Once the system is instituted, the common objective of all three groups is to realize the full potential benefits by totally displacing conventional methods.

Many complex inter-relationships throughout agriculture as well as competitive pressures within the dairy industry have historically reflected the tendency toward uniformity in methods and equipment. This uniformity, however, is perhaps less true in milk production than in the processing and marketing elements of the industry.

Appendix

Appendix Table 1.—Number of milking herds, and milk production by size of herd, United States, 1929, 1939, 1944,[1] and 1950

Size of milking herd (Number of cows)	Number of milking herds (thousands)				Percent of total milking herds			
	1929	1939	1944	1950[2]	1929	1939	1944	1950
1 to 2	2,275	2,358	2,346	1,705	49.3	50.6	52.4	46.3
3 to 9	1,782	1,712	1,438	1,321	38.6	36.7	32.1	35.9
10 to 19	454	467	527	473	9.8	10.0	11.8	12.8
20 to 29	73	85	114	119	1.6	1.8	2.5	3.2
30 or more	32	41	56	64	.7	.9	1.2	1.8
Total	4,616	4,663	4,481	3,682	100.0	100.0	100.0	100.0

Size of milking herd (Number of cows)	Milk production (million gallons)				Percent of total milk production			
	1929	1939	1944	1950[3]	1929	1939	1944	1950
1 to 2	1,374	1,370	1,367		12.4	11.9	10.8	
3 to 9	4,347	4,025	3,536		39.3	35.0	27.8	
10 to 19	3,331	3,482	4,026		30.2	30.3	31.6	
20 to 29	1,041	1,255	1,739		9.4	10.9	13.7	
30 or more	959	1,376	2,052		8.7	11.9	16.1	
Total	11,052	11,508	12,720		100.0	100.0	100.0	

[1] U. S. Bur. of Agr. Econ. Changes in the Dairy Industry United States, 1920–50, p. 2034. Washington 1950.
[2] Data from 1950 Census of Agriculture.
[3] No strictly comparable data available.

Appendix Table 2.—Numbers of commercial dairy farms, and average number of milk cows per farm, U. S., by States and regions, 1950 [1]

State and region	Number of commercial dairy farms	Average number of milk cows per farm	Percent of United States commercial dairy farms
Maine	4,999	12.6	
New Hampshire	3,003	15.6	
Vermont	10,823	21.3	
Massachusetts	4,515	20.4	
Rhode Island	595	21.1	
Connecticut	3,848	22.6	
New England	27,780	19.2	4.61
New York	55,169	20.3	
New Jersey	4,041	28.9	
Pennsylvania	43,541	14.7	
Middle Atlantic	102,751	18.3	17.07
Delaware	1,229	18.2	
Maryland	6,828	21.6	
Virginia	8,170	18.2	
West Virginia	4,341	12.2	
North Carolina	5,312	14.9	
South Carolina	1,590	21.4	
Georgia	2,936	25.2	
Florida	930	93.1	
South Atlantic	31,336	20.6	5.21
Wisconsin	116,529	15.6	
Illinois	15,866	15.6	
Michigan	45,800	10.9	
Ohio	32,556	11.1	
Indiana	16,057	10.0	
East North Central	226,808	13.6	37.67
Minnesota	50,118	12.3	
Iowa	7,907	12.3	
Nebraska	2,912	10.2	
Missouri	29,743	10.6	
Kansas	8,701	11.6	
North Dakota	2,558	11.8	
South Dakota	1,931	11.9	
West North Central	103,870	11.7	17.25
Texas	9,669	28.7	
Louisiana	3,157	26.5	
Oklahoma	8,449	13.8	
Arkansas	6,608	11.3	
West South Central	27,883	19.8	4.63
Kentucky	9,041	12.0	
Tennessee	14,611	12.4	
Mississippi	7,272	17.3	
Alabama	2,554	25.6	
East South Central	33,478	14.4	5.56

Appendix Table 2.—Numbers of commercial diary farms, and average number of milk cows per farm, U. S., by States and regions, 1950 [1]—Continued

State and region	Number of commercial dairy farms	Average number of milk cows per farm	Percent of United States commercial dairy farms
Arizona	838	30. 7	
Utah	3, 641	12. 6	
Idaho	6, 286	10. 6	
Montana	1, 821	13. 8	
Colorado	3, 135	15. 5	
Wyoming	822	16. 3	
Nevada	354	24. 7	
New Mexico	671	24. 7	
Mountain	17, 568	14. 3	2. 92
California	13, 466	43. 9	
Oregon	6, 618	15. 3	
Washington	10, 535	15. 3	
Pacific	30, 619	27. 9	5. 08
United States	602, 093	15. 8	100. 00

[1] 1950 Census of Agriculture.

Appendix Table 3.—Number of farms with milking machines and bulk milk cooling tanks by regions, for specified years [1]

Region	Number of farms with milking machines			Commercial dairy farms, 1950 census		Number of farms with milking machines, Jan. 1, 1952 (estimated)	Number of farms equipped with bulk milk cooling tanks, June 1953 (estimated)	Percent of 1950 commercial dairy farms with bulk milk tanks, June 1953 (estimated)
	Jan. 1, 1942 (estimated)	1945 (census)	1950 (census)	Number of farms	Percent with milking machines (estimated) [2]			
New England	15,400	19,086	25,560	27,780	92.0	26,200	272	0.98
Middle Atlantic	52,000	64,387	89,934	102,751	87.5	92,900	264	.26
South Atlantic	5,000	8,056	21,968	31,336	70.1	27,100	382	1.22
East North Central	103,000	146,481	235,800	226,808	-------	248,300	586	.26
West North Central	47,200	75,907	157,622	103,870	-------	169,700	76	.07
West South Central	3,400	7,175	23,114	27,883	83.3	27,900	13	.05
East South Central	2,300	4,349	19,058	33,478	56.9	23,900	-------	-------
Mountain	6,900	14,310	26,664	17,568	-------	31,000	257	1.46
Pacific	19,500	25,296	36,143	30,619	-------	39,000	4,300	14.04
United States	254,700	365,065	635,862	602,093	-------	686,000	6,150	1.02

[1] Data based on Bureau of Agr. Econ., USDA—*Farm Power and Farm Machines*, F. M. 101, p. 28, Washington, Feb. 1953; and Table 2 of this report.
[2] It is obvious that in the 4 regions where estimated percentages of dairy farms equipped are not given, there are farms so equipped that are not defined or classified as "commercial" in the census data.

Appendix Table 4.—Reporting firms with numbers of farm tanks installed, classified according to organizational type, by regions, June 1953

Region	Number of individual proprietorships		Number of partnerships		Number of proprietary corporations		Number of cooperative associations		Totals	
	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks
New England	2	40	1	20	9	167	------	------	12	227
Middle Atlantic	1	11	1	30	10	143	2	53	14	237
South Atlantic	1	14	1	8	7	270	------	------	9	292
East North Central	3	36	2	42	19	335	8	143	32	556
West North Central	------	------	1	1	5	40	4	43	10	84
Mountain	1	15	2	9	6	119	2	36	11	179
Pacific: Washington and Oregon	1	12	1	160	6	229	10	755	18	1,156
West South Central	1	1	------	------	------	------	------	------	1	1
East South Central	------	------	------	------	------	------	------	------	------	------
United States	10	129	9	270	62	1,303	26	1,030	[1] 107	2,732

[1] Includes 5 reporting firms having tanker routes in process of organization.

Appendix Table 5.—Reporting cooperative and other types of firms with numbers of farm tanks installed classified according to principal operating function, by regions, June 1953

Region	Number of firms other than cooperatives[1]								Number of cooperative firms										Combined Totals	
	Distributing		Distributing and processing		Processing only		Distributing		Distributing and processing		Processing only		Bargaining and processing		Bargaining, distributing, and processing		Total			
	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks
New England	3	46	9	181	----	----	12	227	----	----	----	----	----	----	----	----	----	----	12	227
Middle Atlantic	2	18	9	158	1	8	12	184	----	----	----	----	----	----	2	53	2	53	14	237
South Atlantic	----	----	7	274	----	----	7	274	----	----	----	----	----	----	----	----	----	----	7	274
East North Central	4	78	13	202	6	131	23	411	3	40	----	----	5	103	----	----	8	143	31	554
West North Central	1	1	5	40	----	----	6	41	2	28	----	----	2	15	----	----	4	43	10	84
Mountain	----	----	10	167	----	----	10	167	1	12	----	----	----	----	----	----	1	12	11	179
Pacific	----	----	4	120	3	260	7	380	2	75	1	140	3	127	3	413	9	755	16	1,135
West South Central	----	----	1	1	----	----	1	1	----	----	----	----	----	----	----	----	----	----	1	1
East South Central	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
United States	10	143	58	1,143	10	399	78	1,685	8	155	1	140	10	245	5	466	24	1,006	102	2,691

[1] This category includes all reporting firms that are not farmer cooperatives.

Appendix Table 6.—Reporting firms with numbers of farm bulk tanks classified according to principal type of milk handling operation, by regions, June 1953

Region	Fluid milk		Receiving stations		Cheese factories		Butter-powder plants		Condenseries		Diversified processing		Total	
	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks	Firms	Tanks
	Number													
New England	12	227	----	----	----	----	----	----	----	----	----	----	12	227
Middle Atlantic	12	222	----	----	----	----	----	----	----	----	2	15	14	237
South Atlantic	7	269	----	----	----	----	----	----	----	----	----	----	7	269
East North Central	15	260	6	61	4	80	2	45	----	----	4	34	31	480
West North Central	6	67	----	----	----	----	2	14	----	----	2	4	10	85
Mountain	10	174	----	----	----	----	----	----	----	----	1	5	11	179
Pacific	12	780	3	72	----	----	1	160	1	20	2	24	19	1,056
West South Central	1	1	----	----	----	----	----	----	----	----	----	----	1	1
East South Central	----	----	----	----	----	----	----	----	----	----	----	----	----	----
United States	75	2,000	9	133	4	80	5	219	1	20	11	82	[1] 105	2,534

[1] Includes 3 reporting firms having tanker routes in process of organization.

Appendix Table 7.—Comparisons of average size of milking herds among bulk milk and can shippers, reporting plants by regions, June 1953

Region	Number of firms	Bulk shippers					Can shippers				
		Number of farms	Range in average size of herd (number of cows) by plants		Average herd size	Median herd size [1]	Number of farms	Range in average size of herd (number of cows) by plants		Average herd size	Median herd size [1]
			High (average)	Low (average)				High (average)	Low (average)		
New England	11	221	65	20	43	40	829	40	12	22	20
Middle Atlantic	9	128	50	28	38	37	2,335	35	12	22	20
South Atlantic	7	274	150	25	60	45	1,719	50	20	32	30
East North Central	26	450	61	18	30	28	5,775	40	12	20	20
West North Central	7	73	75	25	39	35	3,529	22	10	15	15
Mountain	9	154	150	30	62	45	1,896	60	17	32	30
Pacific	15	1,117	50	20	30	25	6,256	28	12	19	16
United States	84	2,417	----	----	----	----	22,339	----	----	----	----

[1] The median refers to the middle or central figure in an array of all herd sizes reported, from smallest to largest.

Appendix Table 8.—Reported ranges and typical rated capacities of farm bulk tanks installed on farms shipping to reporting plants, by regions, June 1953

Region	Number of firms	Number of farms	Range of tank capacity (in gallons)												Average or typical capacity (gallons)							
			Number of firms reporting largest tank at:						Number of firms reporting smallest tank at:													
			Over 600	600	500	400	300	200	Under 100	100	150	200	300	Over 300	100 or less	150	200	300	400	500	600	Over 600
															Number of firms							
New England	12	227	----	7	1	2	2	----	1	3	2	6	----	----	----	1	1	5	5	----	----	----
Middle Atlantic	14	200	3	----	5	3	3	----	2	3	5	3	1	----	----	2	6	5	1	----	----	----
South Atlantic	7	269	2	3	1	1	----	----	1	----	4	1	1	----	----	----	----	6	1	----	----	----
East North Central	30	550	----	5	5	7	9	4	3	10	8	8	1	----	----	8	13	6	3	----	----	----
West North Central	9	84	2	2	2	1	1	1	----	----	3	2	4	----	----	----	2	6	1	----	----	----
West South Central	1	1	1	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	1
Mountain	11	179	4	2	4	----	1	----	----	----	2	5	1	3	----	----	3	3	3	----	1	1
Pacific	18	1,080	13	2	3	----	----	----	----	5	7	5	----	1	----	1	4	9	3	1	----	----
United States	102	2,590	25	21	21	14	16	5	7	21	31	30	8	5	----	12	29	40	17	1	1	2

Appendix Table 9.—Comparison of predominant general type of farm bulk tank refrigeration systems among producers of reporting firms, by regions, June 1953

Region	Number of reporting plants	Number of farm bulk tanks	Number of plants with predominant type of cooling and storage tank		
			"Cold-wall direct expansion refrigerated"	"Ice-bank sweet water refrigerated"	About half "cold-wall" and half "ice-bank"
New England	12	227	11	1	---
Middle Atlantic	13	226	13	---	---
South Atlantic	7	274	7	---	---
East North Central	31	554	13	14	4
West North Central	10	84	5	4	1
Mountain	11	179	10	1	---
Pacific	18	1,156	11	2	5
United States	102	2,700	70	22	10

Appendix Table 10.—Milking parlors and pipeline milking systems installed on farms of bulk milk shippers delivering to reporting plants by regions, June 1953 [1]

Region	Total reporting plants	Number of plants reporting milking parlor-pipeline installations among patrons	Number of bulk tanks on farms of plants reporting milking parlor and pipeline systems	Number of milking parlor-pipeline shippers with tanks	Percent milking parlor-pipeline installations to total number of farms with bulk tanks
New England	12	4	121	5	4.1
Middle Atlantic	14	8	120	9	7.5
South Atlantic	9	6	260	27	10.4
East North Central	31	17	232	38	16.4
West North Central	7	6	76	31	40.8
Mountain	10	8	133	73	54.9
Pacific	18	13	1,073	96	8.9
West South Central	1	1	1	1	100.0
United States	102	63	2,016	280	13.9

[1] Large numbers of these dairy farm installations are reported in the 2 States not surveyed, namely, California and Florida.

Appendix Table 11.—Plant policy with respect to ownership and operation of farm tankers and can trucks, and financial assistance to "for-hire" tank truck operators, by regions, June 1953

Region	Number of plants that own and ope rate can trucks		Number of plants that own and operate:			Number of plants that provide direct initial financial assistance [1] to "for-hire" tank haulers		All tankers but no can trucks	Can trucks but no tankers
	Yes	No	All tankers	Some tankers [2]	No tankers	Yes	No [3]		
New England	4	7	6	5	2	---	[4] 6	5	---
Middle Atlantic	---	13	6	---	8	1	7	6	---
South Atlantic	1	6	2	---	5	---	5	1	---
East North Central	11	20	18	1	12	8	5	1	2
West North Central	4	5	3	1	2	1	2	2	---
Mountain	6	4	6	1	2	1	2	1	---
Pacific	7	10	12	---	5	---	5	5	1
West South Central	---	---	1	---	---	---	---	1	---
United States	33	65	54	8	36	11	32	22	3

[1] In a number of instances this took the form of plant ownership and "free leasing" of the truck tank to "for-hire" haulers.
[2] Split-ownership; where more than one tanker delivers regularly to a plant.
[3] Only those firms having one or more "for-hire" tank truck operators are considered here.
[4] One plant did not report this information.

Appendix Table 12.—Number and percent of farm tankers owned and operated by plants, by "for-hire" haulers,[1] and by producers, by regions, June 1953

Region	By plants [2]		By "for-hire" haulers		By producers		Total	
	Number	Percent of total	Number	Percent of total	Number	Percent of total	Number	Percent of total
New England	11	12.2	9	11.0	1	7.7	21	11.4
Middle Atlantic	7	7.7	10	12.2	1	7.7	18	9.7
South Atlantic	2	2.2	25	30.5	1	7.7	28	15.2
East North Central	23	25.5	20	24.4	2	15.4	45	24.3
West North Central	4	4.4	2	2.4	2	15.4	8	4.3
Mountain	9	10.0	6	7.3	2	15.4	17	9.2
Pacific	33	36.6	10	12.2	4	30.8	47	25.4
West South Central	1	1.1	---	---	---	1	1	.5
United States	90	48.6	82	44.3	13	7.0	185	100.0

[1] Operated under contractual arrangements with either the plant or the producers served.
[2] Several plants owned tankers and leased them to "for-hire" operators.

Appendix Table 13.—Regional classification of operating farm tank transports according to structural type and volume capacity, June 1953

Region	Number of straight-frame farm tank trucks with capacity in gallons of—									Number of trailer-tank transports with capacity in gallons of—							Combined totals
	1,000 or less	1,000 to 1,500	1,500	1,500 to 1,800	1,800	1,800 to 2,000	2,000	Over 2,000	Total	2,000 or less	2,250	2,250	2,750	3,000	Over 3,000	Total	
New England	1	1	1	2	1	1	1	5	13	----	----	1	1	1	5	8	21
Middle Atlantic	----	----	4	----	4	----	3	2	13	----	1	1	----	6	2	10	23
South Atlantic	1	----	6	1	8	2	2	4	24	----	----	2	----	2	----	4	28
East North Central	9	10	17	----	4	----	4	----	44	----	----	----	----	2	----	2	46
West North Central	2	1	3	----	----	----	1	----	7	----	----	----	1	----	----	1	8
Mountain	----	----	3	----	1	1	----	----	5	----	1	6	3	----	1	11	16
Pacific	1	2	21	5	1	----	1	----	31	2	2	9	----	----	----	13	44
West South Central	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	1	1
United States	14	14	55	8	19	4	12	11	137	2	4	19	o	11	8	50	187

Appendix Table 14.—Frequency and flexibility of collection under farm tanker assembly operations at reporting plants, by regions, June 1953

Region	Consistent every-day collection				Consistent every-other-day collection				Mixed pattern of collection			
	Number of plants	Number of routes	Number of plants receiving 2 or more loads daily from tankers	Number of tankers delivering 2 or more loads daily	Number of plants	Number of routes	Number of plants receiving 2or more loads daily from tankers	Number of tankers delivering 2 or more loads daily	Number of plants	Number of routes	Number of plants receiving 2 or more loads daily from tankers	Number of tankers delivering 2 or more loads daily
New England	7	11	3	3	2	5	1	2	3	6	1	1
Middle Atlantic	6	11	3	3	5	9	2	2	3	4	------	------
South Atlantic	3	16	2	4	2	2	1	1	2	10	1	1
East North Central	17	27	3	7	8	12	1	1	7	10	5	6
West North Central	2	3	1	1	3	4	1	1	1	4	1	1
Mountain	2	4	2	2	3	4	------	------	4	10	1	1
Pacific	------	------	------	------	16	62	8	22	2	11	1	2
West South Central	------	------	------	------	1	1	------	------	------	------	------	------
United States	37	72	14	20	40	99	14	29	22	55	10	12

Appendix Table 15.—Summary of ranges and average rates charged producers by plants owning and operating can trucks and routes, by regions, June 1953

Region	Number plants reporting	Rates charged producers per hundredweight of milk (cents)												Number of plants charging flat rate
		High range				Low range				Average range				
		High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median	
New England	7	55	25	41	40	30	20	23	24	38	23	31.5	31	1
Middle Atlantic	0	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
South Atlantic	1	65	-----	65	65	20	-----	20	20	35	-----	35	35	-----
East North Central	1	45	-----	45	45	45	-----	45	45	45	-----	45	45	1
Mountain	5	60	40	48	42	-----	-----	-----	-----	60	40	48	42	5
Pacific	4	45	20	35	37	35	20	30	32	37	20	32	34	2
Total	18	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9

Appendix Table 16.—Summary of ranges and average can-hauling rates charged producers and "subsidies" paid by plants served by "for-hire" milk haulers, by regions, June 1953.

Region	Number of plants reporting	Basic rates charged producers per hundredweight of milk (cents)												Subsidy paid to "for-hire" haulers (cents per hundredweight)					Total payment to haulers (cents per hundredweight)			
		High range				Low range				Average range				Number of plants with flat rate	Number of plants paying subsidy	Amount paid			High (Average)	Low (Average)	Average	Median
		High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median			High	Low	Average				
New England	5	50	35	41	39	35	20	26	25	40	30	35	34.5	1	0	----	----	----	50	20	35	34.5
Middle Atlantic	11	43	25	35	35	35	10	22	20	35	17	27	29	3	0	----	----	----	43	10	27	29
South Atlantic	4	45	30	39	40.5	35	18	26	25.5	40	25	31	29.5	00	0	----	----	----	45	18	31	29.5
East North Central	23	45	8	25	22	45	8	19	17	45	8	21.5	19.5	11	10	16	1	6	45	14	23	20
West North Central	5	60	24	45	50	30	16	24	25	37	20	26	23.5	1	2	4	4	4	60	20	29	27
Mountain	4	80	20	47	44	40	20	28	26.5	60	20	37	34	1	1	4	4	4	80	24	38	34
Pacific	7	41	20	30.5	30	28	16	22	20.5	30	20	26	28	2	0	----	----	----	41	16	26	28
West South Central	1	30	20	25	25	----	----	----	----	----	----	----	----	0	0	----	----	----	30	20	25	25
Total	55	----	----	----	----	----	----	----	----	----	----	----	----	18	13	----	----	----	----	----	----	----

Appendix Table 17.—Summary of ranges and average bulk milk hauling rates charged producers under every-day collections and subsidies paid by plants to haulers, by regions, June 1953

Region and system used to procure milk	Number of plants reporting rates	Number of plants reporting flat rates	Hauler subsidy paid		Basic rates charged producers (cents per cwt.)											
					High range				Low range				Average range			
			Number of plants	Cents per cwt.	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median
New England:																
Company	7	2	----	----	45	15	30.5	30	25	15	20.5	20	35	15	26.5	25
"For hire"	3	1	1	3.5	33	30	32	33	30	19	23	19	30	26	27	26
Middle Atlantic:																
Company	2	1	----	----	25	15	20	----	20	15	17.5	----	21	15	18	----
"For hire"	6	4	2	10	40	10	26	25	40	10	22	21	40	10	24	23
South Atlantic:																
Company	2	2	----	----	20	15	17.5	----	20	15	17.5	----	20	15	17.5	----
"For hire"	2	0	----	----	30	30	30	30	28	18	23	----	29	25	27	----
East North Central:																
Company	10	7	----	----	28	10	15.5	12.5	23	10	13.5	11	25	10	14.5	12
"For hire"	8	4	4	3, 5, & 6	30	15	20	20	20	10	15.5	16	20	14	17.5	17.5
West North Central:																
Company	2	2	----	----	24	17	20.5	----	24	17	20.5	----	24	17	20.5	----
"For hire"	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mountain:																
Company	5	5	----	----	60	16	34	35	60	16	34	35	60	16	34	35
"For hire"	2	2	1	4	30	24	27	27	30	24	27	27	30	24	27	27
Pacific:																
Company	1	1	----	----	22	22	22	----	22	22	22	----	22	22	22	----
"For hire"	1	1	----	----	20	20	20	----	20	20	20	----	20	20	20	----
Total:																
Company	29	20	0	----	----	----	----	----	----	----	----	----	----	----	----	----
"For hire"	22	12	9	----	----	----	----	----	----	----	----	----	----	----	----	----

Appendix Table 18.—Summary of ranges and average bulk milk hauling rates charged producers under every-other-day collections and subsidies paid by plants to haulers, by regions, June 1953

Region and system used to procure milk	Number of plants reporting rates	Number of plants reporting flat rates	Hauler subsidy paid		Basic rates charged producers (cents per cwt.)											
					High range				Low range				Average range			
			Number of plants	Cents per cwt.	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median	High (Average)	Low (Average)	Average	Median
New England:																
Company	1	1	----	----	15	15	----	----	15	15	----	----	15	----	15	15
"For hire"	1	1	----	----	35	35	----	----	35	35	----	----	35	----	35	35
Middle Atlantic:																
Company	4	2	----	----	25	17	20	19	20	12	16	16.5	31.5	15.5	21.5	19
"For hire"	1	0	----	----	35	----	----	----	25	----	----	----	31	----	31	--
South Atlantic:																
Company	1	1	----	----	20	20	20	----	20	20	20	----	----	----	20	--
"For hire"	2	----	----	----	30	30	30	30	28	18	23	----	29	25	27	----
East North Central:																
Company	8	6	----	----	30	8	19	21	30	8	16.5	14.5	30	8	18	18
"For hire"	6	3	3	20,15 & 8	30	20	26.5	26	30	18	24	23.5	32	20	25	24
West North Central:																
Company	3	3	----	----	25	20	21.5	20	25	20	21.5	20	25	20	21.5	20
"For hire"	3	0	1	7	31	25	28.5	30	25	15	19	17	27.5	22	23.5	22
Mountain:																
Company	5	5	----	----	60	16	33	35	60	16	33	35	60	16	33	35
"For hire"	1	1	----	----	24	24	24	----	24	24	24	----	24	24	24	----
Pacific:																
Company	9	5	----	----	38	10	25	25	38	10	22	20	38	10	23	22
"For hire"	5	2	----	----	38	17	23.5	19	28	17	19.5	17	33	17	21.5	20
Total:																
Company	31	23	0	----	----	----	----	----	----	----	----	----	----	----	----	----
"For hire"	19	7	4	----	----	----	----	----	----	----	----	----	----	----	----	----

Selected References

Baum, E. L., and Pauls, D. E.
1953. A comparative analysis of costs of farm collection of milk by can and tank in western Washington, 1952. Wash. Agr. Expt. Sta. Tech. Bul. 10, 37 pp.

Baum, E. L., Riley, R. D., and Weeks, E. E.
1954. Economies of scale in the operation of can and tank milk receiving rooms, with special reference to western Washington. Wash. Agr. Expt. Sta. Tech. Bul. 12, 70 pp.

Beal, George Max, and Twining, Carl R.
1953. Bulk handling of milk in the Washington, D. C., milk shed. Md. Agr. Expt. Sta. Misc. Pub. 176, 39 pp.

Burress, Tom
1953. The bulk pick-up system of marketing milk. 27 pp. The Heil Co., Milwaukee, Wis.

Clarke, D. A., Jr.
1947. A comparative analysis of the costs of operating milk collection routes by can and by tank in California. Calif. Agr. Expt. Sta. Mimeo. Rpt. 91, 46 pp.

Miller, Arthur H.
1953. Economic aspects of bulk milk handling—comments and tables relating to milk hauling costs in cans and in bulk. Univ. of Wis. Dept. of Agr. Econ. release. 16 pp.

Morris, W. H. M., March, R. P., White, V. C., and Turner, C. N.
(n. d.) Bulk cooling and storage of milk on the farm. N. Y. (Cornell) Ext. Bul. 899, 23 pp.

Murray, Donald L., and Hall, Carl W.
1954. Bulk tank cooling of milk on the dairy farm. Mich. St. Col. Ext. Folder F–178. 6 pp.

Myrick, Norman
1953. Where do we stand after five years of bulk handling. Amer. Milk Rev. xv:9. p. 10.

Nelson, Glen T.
1953. Economic aspects of farm tank handling of milk in Oregon. Oreg. Agr. Expt. Sta. Cir. of Inf. 520. 11 pp.

Preston, Homer J.
1954. Butterfat sampling in bulk handling and comparative milk solids losses. Gen. Rpt. 10, U. S. Farmer Cooperative Service. 32 pp.

U. S. Farmer Cooperative Service
1952. Milk tanks now here and still coming. Reprint 37 from News for Farmer Cooperatives, Wash., D. C.

U. S. GOVERNMENT PRINTING OFFICE: 1958 O - 449130

Other Publications Available

Agricultural Cooperation in the United States. Bulletin 54. *Ward W. Fetrow.*
Using Your Fluid Milk Co-op. Circular E–14. *Harry Trelogan.*
Using Your Co-op Creamery. Circular E–6. *Paul E. Quintus.*
Butter Pricing by Iowa Creameries. Circular C–136. *A. G. Mathis* and *Donald E. Hirsch.*
Dairy Breeding Cooperatives. Circular C–133. *Donald E. Hirsch* and *Irwin R. Hedges.*
Dairy Cooperatives and Large-Scale Plants. Miscellaneous Report 155. *Donald E. Hirsch.*
Farm-to-Plant Milk Hauling Practices of Dairy Cooperatives. Bulletin 69. *Joseph M. Cowden.*
Fall Premium Milk Pricing Plans. FCS Circular 4. *Norris T. Pritchard.*
Estimating the "Market Value" of a Milk Distributing Business. General Report 3. *Donald E. Hirsch.*
Developing Butterfat Sampling and Testing Programs. FCS Bulletin 5. *Homer J. Preston.*

Copies of these publications may be obtained upon request while a supply is available from the

Director of Information

FARMER COOPERATIVE SERVICE

U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.